

REVISIONARY NOTES ON THE GENUS *PAUOPSALTA* GODING AND FROGGATT (HOMOPTERA: CICADIDAE) WITH SPECIAL REFERENCE TO QUEENSLAND

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Ewart, A. 1989 11 13: Revisionary notes on the genus *Pauopsalta* Goding and Froggatt (Homoptera: Cicadidae) with special reference to Queensland. *Mem. Qd Mus.* 27(2): 289-375. Brisbane. ISSN 0079-8835.

Ten new species of Queensland *Pauopsalta* are described: *P. corticinus*; *P. fuscata*; *P. collina*; *P. aktites*; *P. opacus*; *P. vitellinus*; *P. virgulatus*; *P. siccanus*; *P. ayrensis*; and *P. aquilus*. The following new combinations are proposed (including non-Queensland species): *P. rubea* (Goding and Froggatt), a new senior synonym of *Cicadetta geisha* Distant; *P. marginata* (Leach); *P. eyrei* (Distant); *P. rubristrigata* (Goding and Froggatt); *P. infuscata* (Goding and Froggatt); and *P. dolens* (Walker). Redescriptions are given of the following species: *P. mneme* (Walker); *P. melanopygia* (Germar); *P. extrema* (Distant), which is reinstated as a valid species; *P. infrasila* Moulds; *P. encaustica* (Germar); *P. nigristriga* Goding and Froggatt; *P. annulata* Goding and Froggatt; *P. elgneri* Ashton; and *P. basalis* Goding and Froggatt, which is treated as a new senior synonym of *P. endeavourensis* Distant. Oscillograms of calling songs are provided for eighteen species and the gross song structures are shown to be species-specific, although significant intraspecific regional variability does occur. Based primarily on male genitalia, five species-groups are recognised: the *P. mneme*, *P. marginata*, *P. annulata*, *P. aquilus* and *P. basalis* groups.

□ *Cicadas, Queensland, taxonomy, insect song, acoustic communication, insect ecology.*

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The Cicadoidea are a large group of homopterous insects that are especially abundant in the sub-tropical and tropical regions of the world. One hundred and ninety-five species have been described from Australia (Moulds, in press) where the group is well noticed by the general public because of their conspicuous songs. These calls are produced by specialised tymbals situated on either side of the male cicada, between the abdomen and mesothorax. Corresponding organs, the tympana, situated on the undersides of the abdomen of both males and females, are acoustic receptors that are sensitive to the males' calls. Although other Homoptera have similar structures for generating and receiving sounds, only the cicadas produce conspicuous airborne calls and possess highly specialised auditory organs. These calls are apparently species-specific (e.g. Claridge, 1985).

The taxonomy of the Australian cicadas is based mainly on the pioneer descriptions of Distant (many of which are summarised in his 1906 'Synonymic Catalogue'), the early monograph of Goding and Froggatt (1904), and Ashton (1912a,b; 1914). Goding and Froggatt (1904) divided the Australian cicadas into those with tymbal covers (Cicadinae) and those without (Tibiceninae). The majority of the smaller cryptic species were placed in the latter group under *Pauopsalta* Goding and Froggatt or *Melampsalta* Kolenati. Six cicada families were listed by Duffels and van der Laan

(1985): Tettigarctidae, Cicadidae, Tibicinidae, Tettigadidae, Plautillidae, and Platypediidae. *Pauopsalta*, lacking dorsal hoods covering the tymbals, was placed within Tibicinidae, and in the tribe Cicadettini *sensu* Duffels and van der Laan (1985).

The two main characters of *Pauopsalta* were summarised by Myers (1929a) as follows: head as wide as or a little wider than front of pronotum, and five apical cells on the hind wing. The latter character was shown by Hudson (1927:73,74) to be highly variable. Dugdale (1972:860,879) restricted *Pauopsalta* to Australian species with male genital characteristics that had hypertrophied upper pygophore lobes; no sclerotised ventral support; a long, sclerotised endotheca, often ornamented apically; pseudoparameres usually dorsal, longer than shaft, and often clavate or spinose apically.

Duffels and van der Laan (1985) listed 24 nominal species in *Pauopsalta* and Moulds (1987) added *P. infrasila* from Queensland. I recognise 19 species from Queensland, of which 10 are new. The remaining species are redescribed, including *P. encaustica* (from New South Wales); *P. marginata*, *P. rubea*, and *P. eyrei* which are each transferred from *Cicadetta* Kolenati, while *P. geisha* is treated as a new junior synonym of *P. rubea* and *P. endeavourensis* is a new junior synonym of *P. basalis*.

This work subdivides the Queensland *Pauropsalta* species into natural groupings. Extensive use is made of male genital structures, which are valuable for generic classification (e.g. Dlabola 1962, 1963; Orian 1963; Dugdale 1972; Duffels 1965, 1968, 1970, 1977, 1983) and also important at the species level. Where possible, oscillograms of the male songs are provided because these are particularly important as isolating mechanisms (e.g. Fleming 1975) and thus useful in differentiating morphologically similar species.

MATERIAL AND TECHNIQUES

Terminology follows Duffels (1977), Moulds (in press), Dugdale (1972), and Distant (1906a). Ranges and means are presented for five measurements (in mm): fore wing length; body length (which is the maximum length between apex of postclypeus and apex of pygophore or ovipositor); width of head (maximum transverse dimension across outer margins of compound eyes); and widths of pronotum and abdomen (maximum transverse dimensions, the latter across tegite 2).

Song recordings were made with a Grundig TK3200 portable reel-to-reel tape recorder, at a tape speed of 19 cm/s. Oscillograms of the tapes have been prepared in the laboratory facilities of Dr D. Young, Department of Zoology, University of Melbourne, at film speeds of 2.5, 10 and 50 cm/s. Only calling songs have been studied. Although recordings have been made in the field, it has frequently been found desirable to record the insects in boxes or cages. By varying the lighting, cicadas can usually be induced to emit their normal calling songs. In this situation, unwanted background noises can be eliminated. As well, it overcomes the difficulty of closely approaching *Pauropsalta* species in the field because they are very wary. Song terminology follows that of Young and Josephson (1983).

Specimens examined belong to ten institutions and three private collections. These are: BMNH — British Museum (Natural History), London; HEC — Hope Entomological Collections, University Museum, Oxford; MNDN — Museum National D'Histoire Naturelle, Paris; ANIC — Australian National Insect Collection, Canberra; MV — Museum of Victoria; AM — Australian Museum, Sydney; MM — Macleay Museum, University of Sydney; QM — Queensland Museum, Brisbane; UQIC — Insect collection, Entomology Department, University of Queensland; SAM — South Australian Museum; personal collections belonging to M.S. Moulds, Sydney (MSM), Dr. J. Moss, Brisbane (JM), and the author (AE).

PAUROPSALTA GODING AND FROGGATT

Pauropsalta Goding and Froggatt, 1904:615 (gen.n), 565,596; Distant, 1905:269,272; Distant, 1906a:171,174; Distant, 1906b:163,178; Distant, 1907c:246; Froggatt, 1907:354; Oshanin, 1908:399; Bergroth, 1911:188; Horváth, 1911:607; Ashton, 1912b:27; Ashton, 1912c:80; Horváth, 1912:605; Oshanin, 1912:96; Ashton, 1914:355; Hardy, 1918:71; Davis, 1920:125; Distant, 1920:376; Myers, 1922:9; Myers, 1923:430; Handlirsch, 1925: 1116; Kato, 1926:151; Tillyard, 1926:161; Hudson 1927:73; Myers, 1928:391; Haupt, 1929:230; Myers, 1929a:29; Kato, 1932:38,111,386; Schulze, Kükenthal and Heider, 1933:2548; Haupt, 1935:151; Neave, 1940:628; Cooper, 1941:295; de Seabra, 1942:7; McKeown, 1944:235; Metcalf, 1944:156; Metcalf, 1947: 163; Gomez-Menor, 1951:11; Kato, 1956:25; Gomez-Menor Ortega, 1957:29,77; Dlabola, 1963:50; Metcalf, 1963:401-402; Dugdale and Fleming, 1969:936-937; Dugdale, 1972:856,860-861,877,879-880; Nasr, 1972:151; Holloway 1979:235; Duffels and van der Laan, 1985:300.

TYPE SPECIES

P. leurensis Goding and Froggatt, 1904:615, by original designation, a junior synonym of *P. mme* (Walker, 1850), synonymized by Distant, 1905:272.

DESCRIPTION

♂ genitalia: Long sclerotised endotheca, often ornamented apically; upper pygophore lobes hypertrophied to a pair of blinker-like structures extending posteriorly from pygophore; a pair of hooked processes on claspers either side of endotheca; beak acute and prominent, pointed apically; pseudoparameres joined to endotheca near base, commonly extending apically beyond endotheca, and often clavate or spinose apically; gonocoxite IX bifid with median furrow.

Tymbals: With five ridges (only the dorsal ridge being relatively short) and four inter-ridge sclerites.

Wings: Hyaline; anal margins of hind wings with infuscated spots adjacent to distal end of vein 2A, plus a weak infuscation in clavus (adjacent to plaga); a less obvious infuscation on the fore wings, along the vein 1A + 2A, extending to and darkening towards the junction with veins CuP and CuA₂ (this infuscation absent in *P. eyrei*). The intensity of infuscation varies between species.

Dimensions (Fig. 1a-c): This genus comprises small to small-medium-sized cicadas (10-25 mm body length), which exhibit constant proportional increases in dimensions of body length, head, pronotum, and abdomen with increasing fore wing length. All species exhibit significant variability of

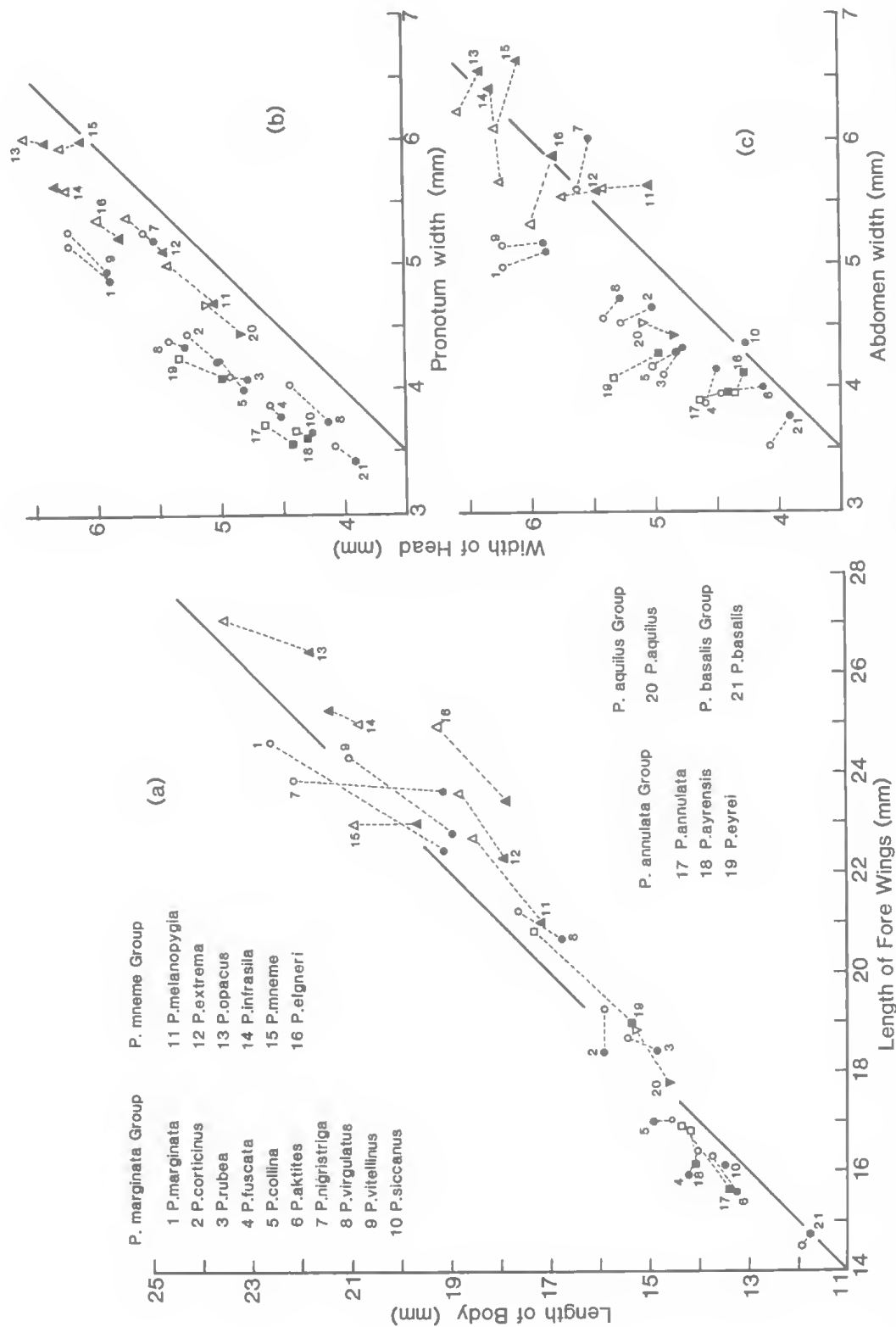


FIG. 1. Plots, in mm, of (a) mean fore wing length versus mean body length; (b) mean widths of head versus pronotum; (c) mean widths of head versus abdomen. The numbers indicate the species as listed. ♂♂ are plotted as solid symbols; ♀♀ as hollow symbols; data for same species joined by dotted lines. Only data for which $n > 5$ are plotted. In each plot, the lines represent 1:1 slopes.

these linear dimensions, within the range of 10-20% of the mean values.

REMARKS

The Queensland members of the genus are active between September to May. They tend to be highly cryptic, fast flying, and wary insects with a preference for open forest habitats (dry sclerophyll), extending to suburban gardens with one species being fully coastal. The insects typically rest on shrubs and trees, at heights varying from ground-level to 15-20 m, and may be heard singing at almost any time of day from sunrise to dusk with a noticeably quiescent period in the early afternoon.

RELATED GENERA

The most closely related genus to *Pauropsalta* is *Ueana* Distant from New Caledonia which shows similar genital specialisations (upper pygophore lobes hypertrophied; long, sclerotised endotheca; dorsal pseudoparameres, longer than shaft), although small genitalia differences are apparent (Dugdale, 1972: 879). Tymbal structures are similar, and similar hind wing infuscations are present in both genera. *Ueana* is, however, characterised by an infuscated basal cell of fore wing. In eastern Australia, *Pauropsalta* superficially resembles species of *Notopsalta* and *Cicadetta*, but can be readily distinguished from these two genera by the presence of infuscation spots on the hind wing in *Pauropsalta* and, in the males, by the hypertrophied upper pygophore lobes (not present in *Notopsalta* or *Cicadetta*).

DISTRIBUTION

The species are concentrated along the coastal regions of Australia. In Queensland it occurs mostly along, and to the east of the Great Dividing Range, and extends through Cape York Peninsula. The overall distribution pattern in eastern Australia corresponds to the classical Spencer-Serventy-Whittell Bassian and Torresian zoogeographic subregions (*sensu* Keast, 1981). One species is confined to the semi-arid subregion (*P. siccanus*), while a second species (*P. eyrei*) has an extensive coastal distribution, northwards from central Queensland and extends through northern Queensland westwards into the Mt Isa area. One species (*P. collina*) is confined to the Great Dividing Range and adjacent high granite country of southeastern Queensland and northeastern New South Wales, extending locally into the sandy soil environments of the western slopes. *P. aktites* is restricted to coastal vegetation on, and immediately behind, the strand and foredune complex.

The distribution of some species (e.g. *P. corticinus*, *P. fuscata*, *P. aktites*, *P. annulata*) extends from southern New South Wales to central, and northern central Queensland, with no evidence for a discontinuity in the Macpherson-Macleay overlap region (*sensu* Littlejohn, 1981, and Keast, 1981). Of interest, however, is the occurrence of outlying populations in southern central Queensland, and of certain of the species in the topographically high plateaux (and associated valleys) of the central highlands (e.g. Carnarvon and Mt Moffatt National Parks), the Blackdown Tableland, and Kroombit Tops.

Another group of *Pauropsalta* species is concentrated in northern Queensland, northwards from the Ingham region, through the Atherton Tableland, and into Cape York peninsula. Two of these species (*P. virgulatus* and *P. infrasila*), however, have localised southern extensions of their distributions into central Queensland.

Considered in terms of their overall distributional patterns, the Queensland species *Pauropsalta* correspond broadly with the Kikkawa-Pearse-Horton zoogeographic subregions (*sensu* Littlejohn, 1981, and Keast, 1981), that is, a Koskian subregion extending northwards from New South Wales to northern Queensland, and the Torresian subregion of northeastern Queensland, including Cape York.

Another interesting aspect is the relative distributions of the three most northern species considered in this paper. These are very closely similar species, which have discrete distributions along the northern coastal region of Western Australia (*P. extrema*), northernmost Northern Territory (*P. melanopygia*), and northern Cape York Peninsula (*P. elgneri*). This pattern suggests the possibility of isolation and subsequent speciation during, and following the last period of maximum aridity (c. 18,000 BP; Bowler, 1982), which is interpreted to have resulted in expansion of the northern desert margins, coupled with the northerly increase of exposed land areas due to lowered sea level.

INFRAGENERIC RELATIONSHIPS

Based on male genitalia, five species-groups are recognised in this study, of which one is represented by a single species. The following list also includes *Pauropsalta* species not redescribed in this study (these do not occur in Queensland and have not been critical in resolving taxonomic problems within the genus). These are marked with an asterisk.

1. The *mneme* group: Upper lobes extended laterally from pygophore (i.e. along length of

pygophore), forming a pair of relatively narrow, elongated processes. Species included are:

mneme (Walker, 1850), *melanopygia* (Germar, 1834), *extrema* (Distant, 1892b) stat. rev., *infrasila* Moulds, 1987, *opacius* sp.n., *elgneri* Ashton, 1912a.

2. The *marginata* group: Distinctive pair of spine-like, or triangular plate-like processes, inward pointing, extending from the inner lobes of pygophore. Species included are:

encaustica (Germar, 1834), **dolens* (Walker, 1850), stat. rev., comb.n., *corticinus* sp.n., *fuscata*, sp.n., *collina*, sp.n., *siccanus* sp.n., *aktites*, sp.n., *rubea* (Goding and Froggatt, 1904), comb.n., *marginata* (Leach, 1814), comb.n., *vitellinus* sp.n., *virgulatus* sp.n., *nigristriga* Goding and Froggatt, 1904.

3. The *annulata* group: Upper pygophore lobes enlarged and erect; inner lobes enlarged and acutely tapering, and posteriorly pointing. Species included are: *annulata* Goding and Froggatt, 1904, *ayrensis* sp.n., *eyrei* (Distant, 1882), comb.n., **rubrisirigata* (Goding and Froggatt, 1904), comb.n..

4. The *aquilus* group: Upper pygophore lobes enlarged, ascending, with relatively acute distal terminations; claspers thickly ridged and rounded. Species included are:

aquilus, sp.n., **infuscata* (Goding and Froggatt, 1904), comb.n..

5. The *basalis* group: Upper, inner, and lower pygophore lobes well defined and ascending. This species-group is the most divergent of the *Pauropsalta*. Species included is:

basalis Goding and Froggatt, 1904.

The following species, although formally included by various authors within *Pauropsalta* (Goding and Froggatt, 1904; Metcalf, 1963; Duffels and van der Laan, 1985), do not possess the characteristic *Pauropsalta* morphology as defined in this work and are therefore excluded from the above species-groups. Their generic status, in most examples, requires further study:

P. bellatrix Ashton, 1914 (Warren River, Western Australia), *P. dameli* Distant 1905 ('Australia'), *P. emma* Goding and Froggatt, 1904 (Rockhampton, Queensland), *P. exaequata* (Distant, 1892a) (Naga Hills, India), *P. fuscomarginatus* Distant 1914 (540 miles west from Sydney, New South Wales), *P. lineola* Ashton 1914 (Western Australia), *P. mimica* Distant, 1907b (Grahamstown, South Africa), *P. minima* Goding and Froggatt, 1904 (Northern Territory, South Australia), *P. mixta* Distant, 1914 (Brewarrina District, New South Wales), *P. signata* Distant,

1914 (Cue, NW Australia), *P. stigmatica* Distant, 1905 (Adelaide, South Australia), *P. subolivacea* Ashton, 1912a (New South Wales), *P. vernalis* Distant, 1916 (Luzon, Mt Makilling, Philippine Islands).

NOMINA DUBIA

The following names (represented only by female specimens), although considered *Pauropsalta* (i.e. have infusate spots on hind wing), could not be allocated to species-groups because of the absence of authentically associated males:

P. borealis Goding and Froggatt, 1904 (Northern Territory; South Australia), *P. castanea* Goding and Froggatt, 1904 (Karth; ?South Australia), *P. extensa* Goding and Froggatt, 1904 (Murray River, South Australia), *P. nodicosta* Goding and Froggatt, 1904 (Kalgoorlie, Western Australia), *P. prolongata* Goding and Froggatt, 1904, stat. rev. (Australia), *P. rubra* Goding and Froggatt, 1904 (Sale, Victoria).

KEY TO MALES OF QUEENSLAND *PAUROPSALTA* SPECIES

In view of the difficulties encountered in unambiguously assigning female specimens to species, the following key is constructed only for males.

1. Upper pygophore lobes extended as elongated (finger-like) processes, relatively acutely terminated..... 2
Upper pygophore lobes not finger-like or acutely terminated (i.e. are blinker-like or bladed, with broadly hooked, rounded, or flat terminations..... 6
2. Body length <13 mm..... *basalis*
Body length >16 mm..... 3
3. Sternites III to VII red to reddish-brown
..... *mneme*
Sternites not red to reddish-brown (colouration yellow, yellow-brown, or orange-brown) 4
4. Tergites 3 to 6 yellow to yellow-brown; two topmost tymbal ridges fused dorsally (medially) (Fig. 7F) *elgneri*
Tergites 3 to 6 not yellow or yellow-brown (colouration ranging from black, brown, to orange-brown); top tymbal ridges not fused 5

5. Hind wing infuscations conspicuous but small; (tergites 3 to 7 black to deep brown with pale brown to orange-brown posterior margins) *opacus*
Hind wing infuscations faintly developed and small; (tergites 3 to 7 orange-brown, darker dorsally) *infrasila*
6. Dorsal tymbal ridge not extending across dorsal inter-ridge sclerite 7
Dorsal tymbal ridge extending across to, or beyond, outer (lateral) edge of dorsal inter-ridge sclerite 12
7. Rostrum extends to hind coxae .. *nigristrigo*
Rostrum not extending to hind coxae 8
8. Upper pygophore lobes with acutely angulated terminations (i.e. broadly hook-like shape); colouration of lobes not black ..
..... 9
Upper pygophore lobes without angulated terminations (extending laterally as terminally rounded, paddle-like blinkers; Fig. 16B); colouration of lobes black *corticinus*
9. Sternites III to VI predominantly (>90%) black to deep brown *collina*
Sternites III to VI not predominantly black to deep brown (<50%; colouration yellow, yellow-brown, orange-brown, reddish-brown, brown, with or without dark median longitudinal fascia) 10
10. Sternites III to VI with dark median longitudinal fascia — remaining colouration orange-brown, reddish-brown, brown, or yellow-brown 11
Sternites III to VI with no darker median fascia, colouration being orange-brown
..... *virgulatus*
11. Two clearly defined infuscation spots on each hind wing, the second infuscation adjacent to plaga; thickly developed tymbal ridges (Fig. 26F) *siccanus*
One clearly defined hind wing infuscation spot, weakly developed (anal margin, distal end of vein 2A); tymbal ridges relatively thinly developed (Fig. 33F) *marginata*
12. Sternites III to VI predominantly (>90%) black to deep brown 13
- Sternites III to VI not dominantly black to deep brown (<50%; colouration orange, orange-brown, yellow, yellow-brown, reddish-brown, pale brown, with or without dark median longitudinal fascia) 14
13. Upper pygophore lobes terminally rounded with conspicuous hook-like shape (Figs 19B-22B); rostrum extends to mid coxae
..... *fuscata*
Upper pygophore lobes not terminated in hook-like form (Fig. 50B); rostrum extends to hind coxae *aquilus*
14. Upper pygophore lobes terminated in a broad hook-like shape 15
Upper pygophore lobes not terminated in conspicuously hook-like shape; (lobes blinker-like with rounded or flat terminations 17
15. Tergite 8 dominantly (>75%) black (tergites 3-7 orange to yellow-brown, with or without subordinate narrow darker bands; sternites III to VI orange, orange-brown, or yellow).
..... *vitellinus*
Tergite 8 not dominantly black (tergites 2-8 each black anteriorly, otherwise reddish-brown; sternites III to VIII yellow-brown to reddish-brown, with or without dark central fascia) 16
16. Hind wing infuscation spots clearly developed; dark median longitudinal fascia on sternites well developed *rubea*
Hind wing infuscation spots weakly developed; median longitudinal fascia on sternites absent or only weakly developed ...
..... *aktites*
17. Tergites 2 to 7 yellow to orange; tergite 8 mostly (>80%) black *eyrei*
Tergites 2 to 8 black with narrow orange brown, yellow, to yellow-brown posterior margins 18
18. Tergites black with prominent orange-brown to orange posterior margins; endotheca broadened apically (i.e. 'trumpet-like'; Fig. 46D) *ayrensis*
Tergites black with yellow to yellow-brown posterior margins; endotheca curved and clindrical, not broadened apically (Fig. 42D) *annulata*

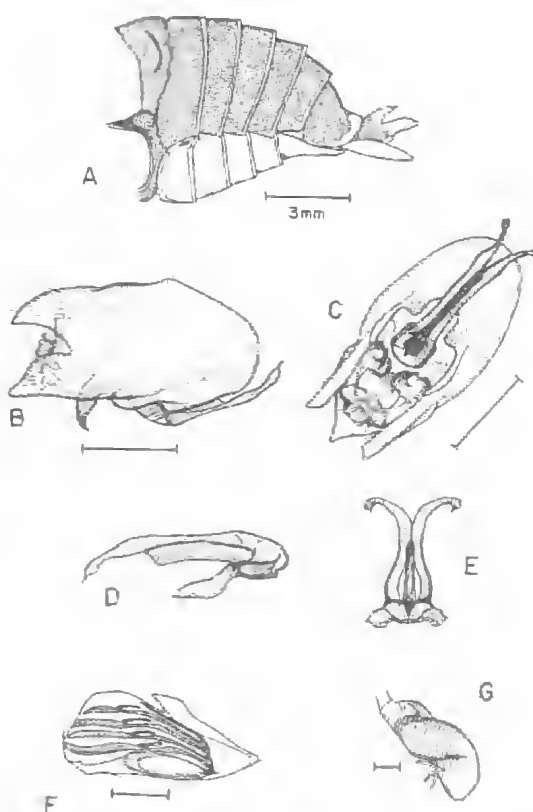
*P. MNEME SPECIES-GROUP****Pauropsalta mneme* (Walker)
(Figs 2,3,4A,B)***Cicada mneme* Walker, 1850:181; Dohrn, 1859:74.*Cicada antica* Walker, 1850:182; Dohrn, 1859:74; synonymized by Stål, 1862:482.*Melampsalta mneme* (Walker) Stål, 1862:484; Myers, 1929b:218; Kato, 1932:32, fig. 37D, 187, plate 23, fig. 8; Burns, 1957: 658-659; Greenup, 1966:62-63.*Melampsalta mnemae* (sic) (Walker) Stål, 1870:718; Distant, 1892a:144.*Pauropsalta mneme* (Walker) Goding and Froggatt, 1904:622-623; Distant, 1906b:178; Froggatt, 1907:354; Kirkaldy, 1907:309; Ashton, 1912b:27; Horváth, 1912:605; Ashton, 1914:355; Hardy, 1918:71; Tillyard, 1926:161, plate 12(18); Metcalf, 1963:409-410; Dugdale, 1972:860,866,878, figs 4,14; Young, 1972:238,241-242, plates 1G,111C; Duffels and van der Laan, 1985:302.*Pauropsalta leurensis* Goding and Froggatt, 1904:616-617, plate 18, figs 8,8a; synonymized by Distant, 1905:272; Davis, 1920:125.**MATERIAL EXAMINED****LECTOTYPE:** ♂ of *Cicada mneme*, here designated, in BMNH. Syntype (blue) and type (green) labels on specimen. No locality data. No ♀ syntype apparently in collection, although its presence is indicated in original description.**HOLOTYPE:** ♂ of *Cicada antica*, in BMNH, bearing green type label. No locality data.**SYNTYPES:** ♂ and ♀ of *Pauropsalta leurensis*, in ANIC: Blue Mountains, New South Wales. Ex MM and 'on permanent loan'.**OTHER MATERIAL:** 5♂♂, 2♀♀ from following localities. QUEENSLAND: 'Queensland' (BMNH). Eukey; Glen Aplin (MV). Girraween N.P. (UQIC). Girraween N.P.; Wyberba, S of Stanthorpe (MSM).**DESCRIPTION****MALE: Head:** Predominantly black. Postclypeus shiny black anteriorly with brown margin; small brown spot dorsally on midline; dorsal surface black with pale brown central triangular area, the apex terminating at midline; pale pubescence on anterior and dorsal surfaces. Anteclypeus shiny black with pale pubescence. Rostrum dark brown, becoming black apically; extends to mid coxae. Gena and mandibular plate black with pale brown marginal ridge and conspicuous pale pubescence; intervening pale brown triangular area adjacent to postclypeus. Antennae deep brown. Ocelli dark red. Eyes dark to medium brown. Dorsal surface of head black with pale brown fascia situated in longitudinal suture between ocelli; conspicuous pale pubescence, especially behind eyes. Vertex lobes shiny black.

FIG. 2. *Pauropsalta mneme* (Walker) ♂, type species of the genus *Pauropsalta*. A: Abdomen, viewed from left laterally, showing extent of darker pigmentation. Scale equals 3 mm. B: Pygophore, viewed laterally from right side. C: Pygophore, viewed from ventral aspect. D: Aedeagus, viewed laterally. E: Aedeagus, viewed from anterior aspect to show structure of gonocoxite IX. F: Left tymbal. G: Left opercula. Based on specimens from Black Mt, A.C.T. Scales represent 1 mm, except where indicated otherwise.

Thorax: Pronotum black with pale brown spindle-shaped central fascia, not extending to anterior or posterior pronotal margins; a pair of small, pale brown dorsolateral semi-circular patches adjacent to pronotal collar; short silver-yellow pubescence.**Mesonotum** black with a pair of narrow pale brown to red-brown dorsolateral fasciae, extending from anterior arms of cruciform elevation; cruciform elevation arms pale brown; wing grooves and adjacent ridges pale brown; pale pubescence conspicuous laterally.**Legs:** Coxae black with narrow pale brown fasciae along margins. Femora black with longitudinal red-brown fasciae on fore legs. Tibiae and

tarsi black to dark brown, becoming paler on hind legs. Claws and spines black to dark brown.

Wings: Hyaline; costal veins of fore wings brown, remaining venation black. Infuscation spots on hind wings, spreading out from distal terminations of 2A veins, are very distinct.

Tymbals: Dorsal ridge short, not extending across dorsal inter-ridge sclerite.

Opercula: Broadly sickle-shaped, rounded along inner (posterior) termination; gently domed medially and shiny; declivous marginal flange, most clearly developed along outer margin; black becoming reddish-brown across posterior area; surface finely rugose.

Abdomen: Tergites black with conspicuous orange posterior margins; narrow reddish-brown zone adjacent to posterior edge to tergite 2; sparse short pale pubescence laterally and dorsolaterally. Sternites red to reddish-brown, with orange to red-brown posterior margins; small dark median areas occur anteriorly on sternites II and VI, and less commonly on sternites III to V.

Genitalia: Pygophore black, medium brown posteriorly; upper lobes elongated laterally, partially twisted, and acutely terminated; claspers sharply pointed and hooked; lower and inner lobes conspicuously bulbous. Aedeagus with dorsal pseudoparameres with clavate and ornamented terminations, extending beyond endotheca.

FEMALE: Essential markings and colouration as for male. Vertex lobes reddish-brown. Pronotum shows additional brown broken colouration adjacent to oblique fissures, and narrow brown to red-brown margin on pronotal collar. Mesonotum with additional pair of narrow reddish-brown lateral fasciae. Tergites have additional narrow red-brown zones adjacent to posterior margins, thickening dorsally; tergite 9 medium to pale brown with pair of black dorsolateral fasciae which in part join posteriorly, and in part decurve sharply posteriorly. Sternite II black; anterior margin of sternite III black, otherwise sternites red to reddish-brown; ovipositor sheath extends only slightly beyond (<1.0 mm) tergite 9.

MEASUREMENTS: 23♂♂ and 11♀♀. Body length: ♂ 16.8-22.1 (19.67); ♀ 18.3-23.1 (20.94). Fore wing length: ♂ 19.8-25.2 (23.03); ♀ 20.3-26.9 (23.00). Head width: ♂ 5.1-6.6 (6.09); ♀ 5.6-7.1 (6.27). Pronotum width: ♂ 5.1-6.9 (6.02); ♀ 5.1-6.6 (5.97). Abdomen width: ♂ 5.8-7.1 (6.62); ♀ 5.1-6.9 (6.08).

DISTRIBUTION

This cicada is widely distributed and common through much of southeastern New South Wales, extending to the Australian Capital Territory,

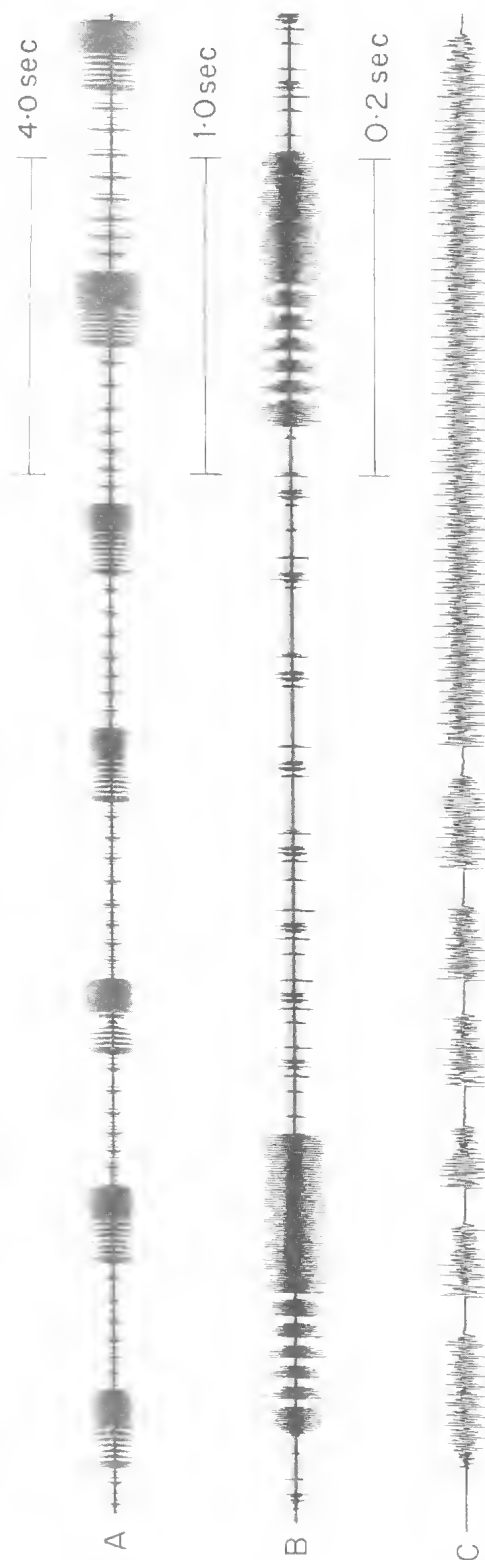


FIG. 3. Oscillograms of calling song of *P. mneme*, recorded from Sutherland, Sydney (JM). The three photographic records are shown for three different time scales, as indicated on the scales.

through Victoria to South Australia in the Adelaide hills, to Orreroo (Moulds, in press). In Queensland, it occurs in the high granite belt country of southeastern Queensland, extending southwards into New South Wales along the northern New England Tableland.

SONG

The main calling song structure comprises sets of seven phrases made up of six short phrase groups followed by a longer, compound phrase group (Fig. 3; see also Young 1972). The initial short phrase group varies from 85-90 msec in length, which reduces to 40-50 msec for the following four phrase groups, lengthening again to 55-60 msec for the sixth (final) short phrase group. The longer, compound phrases last for between 0.42-0.51 sec (based on Fig. 3). Intervals between emission of each of the phrase groups are 20-26 msec, typically becoming slightly shorter as the song progresses. Intervals between the production of each discrete set of seven phrases ranges from 1.6-2.3 sec.

During these intervals between the sets of main compound phrase production, additional isolated short pulse groups are emitted, usually 6 to 8 in number in the available records. These consist, in further detail, of two single, followed by a double, followed by a single pulse subgroups, each quite discrete, with intervening intervals of 10-35 msec.

The finer structure of the various phrase and pulse groups and subgroups can be further resolved by expanded time scale recordings, and are the result of compound pulses (7-8 msec duration) emitted singly, doubly, and in trebles; each of these compound pulses are themselves produced by at least 5 coalescing pulses (indicating carrier pulse repetition frequencies of at least 700 Hz).

COMMENTS

Re-examination of the holotype ♀ of *Paupropsalta prolongata* Goding and Froggatt, 1904, held in ANIC (Ex MM and 'on permanent loan') showed that it is not conspecific with *P. mneme*, although these two species were synonymized by Burns (1957: 658-659); see 'Nomina dubia' list above.

Paupropsalta melanopygia (Germar) (Figs 5,56)

Cicada melanopygia Germar, 1834:59; Walker, 1850:172; Dohrn, 1859:74; Kershaw, 1897:119.

Tibicen melanopygius (Germar) Stål, 1861:618, synonymized by Distant, 1882:132; Goding and Froggatt, 1904:601.

Melampsalta melanopygia (Germar) Froggatt, 1896:531; Froggatt, 1903:420, fig. 1; Kato, 1932:187; Burns, 1957:657-658.

Paupropsalta melanopygia (Germar) Distant, 1906b:179; Kirkaldy, 1907:309; Ashton, 1912a:227; Ashton, 1914:355; McKeown, 1944:234; Metcalf, 1963:408-409; Duffels and van der Laan, 1985:302.

MATERIAL EXAMINED

LECTOTYPE: ♂ of *Cicada melanopygia*, here designated, in HEC (Hem. Type 791 1/3): 'M.I.' (= Melville Island; small white label); 'melanopygia Germ' (blue label).

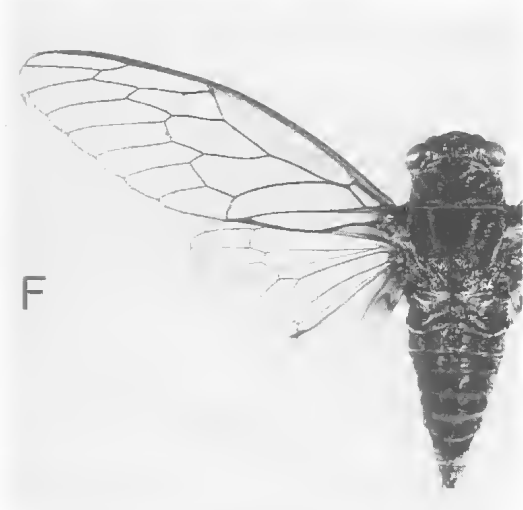
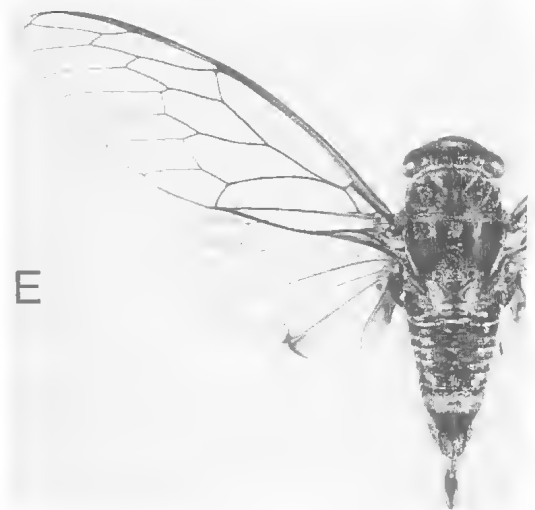
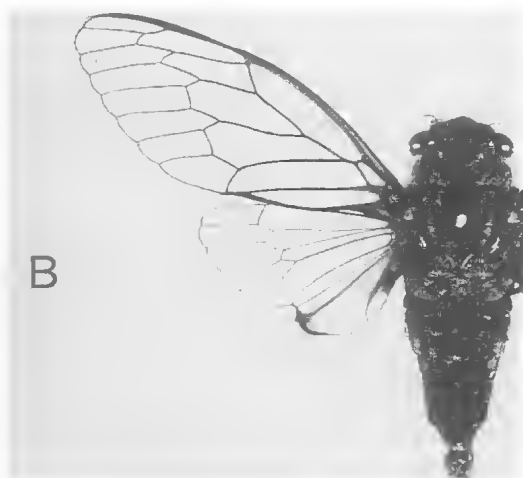
OTHER MATERIAL: 19♂♂, 6♀♀ from following localities. NORTHERN TERRITORY: 15 km E of Mt Cahill (ANIC). Bathhurst Is. (MV). 15 km E of Mt Cahill; 15-17 km E of Mt Cahill; 18 km E of Mt Cahill; Cobourg Peninsula (Smith Pt); Darwin; E Alligator R. crossing via Oenpelli; Elsie Ck, 10 mi. E of Mataranka, on Roper R. Rd; Green Ant Ck, 40 mi. S of Adelaide R.; Melville Is; Z Lagoon to Dip Yard Lagoon, Daly R. (JM). Darwin; Mataranka Hstd, Roper R. (MSM).

DESCRIPTION

MALE: Head: Postclypeus shiny black to deep brown anteriorly; paler broad marginal zone, with pale colouration extending between transverse ridges; distinct pale brown spot dorsally on midline; dorsal surface shiny black; anterior silvery yellow pubescence. Anteclypeus deep brown to black. Rostrum pale brown becoming black apically and extending to hind coxae. Gena and mandibular plate black with pale intervening suture and conspicuous silvery pubescence. Vertex lobes pale to medium brown. Ocelli pink to red. Eyes dark brown. Dorsal surface of head black with narrow pale brown triangular area over longitudinal suture between ocelli; silvery-yellow pubescence especially behind eyes.

Thorax: Pronotum dominantly medium brown with yellow-brown central fascia, anterior margin, pronotal collar, and dorsolateral area behind and adjacent to central fascia; narrow zone immediately adjacent to central fascia deep brown to black; central fascia narrows posteriorly, not reaching pronotal collar; depth of brown colouration between and adjacent to oblique fissures is variable; scattered silvery-yellow pubescence.

Mesonotum with yellow-brown dorsolateral fasciae with irregular outlines, widening sharply medially, but not coalescing, and extending to anterior arms of cruciform elevation; a pair of oblique, broad yellow-brown fasciae coalesce with dorsolateral fasciae close to anterior arms of



cruciform elevation; intervening areas between fasciae black, with wedge-shaped dark brown area adjacent to wing grooves; arms of cruciform elevation yellow-brown with intervening anterior and lateral areas black; fore wing grooves pale orange-brown; silver-yellow pubescence especially conspicuous around cruciform elevation.

Legs: Coxae of fore legs dark brown with yellow-brown lateral and ventral margins; mid and hind coxae patchy brown and yellow-brown; femora medium to dark brown anteriorly, yellow-brown on posterior margins; tibiae and tarsi pale brown to yellow brown; claws and spines medium to dark brown.

Wings: Hyaline; costal veins of fore wings pale yellow brown; remaining venation medium brown, darker around apical cells and ambient vein. Infuscation spots on hind wings relatively faintly developed.

Tymbals: Dorsal ridge extending across dorsal inter-ridge sclerite; lower three ridges joined anteriorly; distinct basal spur.

Opercula: Broadly sickle-shaped, markedly undulate, with relatively acutely tapering inward (posterior) termination (as illustrated in Fig. 5G), although in some specimens more rounded; domed medially; declivous flange along outer margin; predominantly pale yellow to orange-brown with brown colouration restricted to small anterior area; surface finely rugose.

Abdomen: Tergite 2 deep brown along entire anterior margin, otherwise yellow-brown to orange-brown; tergites 3 to 6 orange-brown to yellow-brown with narrow median dorsal dark brown to black bands which rapidly narrow and terminate either side of dorsal surface; tergite 7 orange-brown with median black irregular band extending around most of tergite, terminating at lower edge; tergite 8 black except for irregular pale reddish-brown zone adjacent to posterior margin; posterior margins of tergites yellow-brown. Sternite II brown to black; sternites III to VI, orange-brown; sternite VII mostly dark brown to black; sternite VIII pale orange-brown, in some specimens with anterior brown patches.

Genitalia: Pygophore dark brown anteriorly, pale brown posteriorly; upper lobes elongated laterally, relatively acutely terminated, and somewhat spoon-shaped; prominent ascending and anteriorly strongly curved claspers; prominent ascending median process; dorsal curved

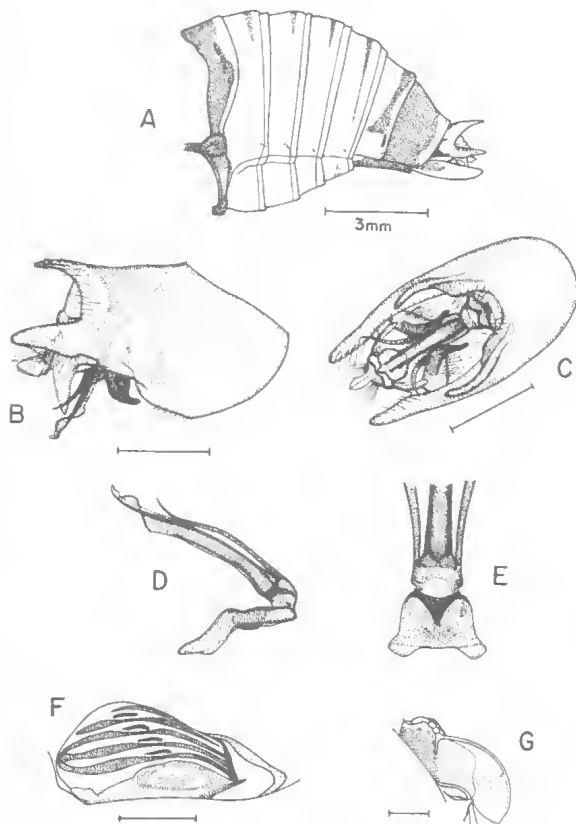


FIG. 5. *Pauropsalta melanopygia* (Germ.) ♂, from specimens in HEC, except for D and E, which are based on specimens from JM collection. Symbols A to G, and scales, as in Fig. 2.

pseudoparameres shorter than endotheca; endotheca with undulating outward flanged termination.

FEMALE: Markings and colouration as in male, with some decrease in extent of darker areas. Pronotum more uniform sandy-brown with medium brown rim around broad central fascia and medium brown broken markings between and adjacent to oblique fissures. Mesonotum shows reduced area of black colouration. Tergites 2 to 8 orange-brown with anterior medium brown bands which terminate laterally and tend to thin and become discontinuous dorsally (especially on tergites 4 to 8); tergite 9 paler orange-brown with a pair of deep brown to black clearly defined dorsolateral fasciae which broaden posteriorly, but do not extend to end of tergite. Sternites pale brown to orange-brown with orange posterior margins; ovipositor sheath extends approximately 2 to 3 mm beyond tergite 9.

MEASUREMENTS: 9♂♂ and 4♀♀. Body length: ♂

FIG. 4. A,B *P. mneme* ♀, ♂. C,D *P. infrasila* ♀, ♂. E,F *P. opacus* ♀, ♂. Each photograph $\times 2$ natural size. Photographs: D.M. Reeves

15.2-19.8 (17.19); ♀ 17.3-20.1 (18.54). Fore wing length: ♂ 17.5-23.4 (21.02); ♀ 21.8-23.4 (22.73). Head width: ♂ 4.0-5.6 (5.03); ♀ 5.3-5.6 (5.40). Pronotum width: ♂ 3.7-5.2 (4.70); ♀ 4.6-5.2 (5.02). Abdomen width: ♂ 4.3-6.4 (5.62); ♀ 5.1-6.1 (5.60).

DISTRIBUTION

Confined to the northern region of Northern Territory (Fig. 56).

COMMENTS

Two ♂ syntypes are identified at HEC (Ewart, in press). The male with the two labels is selected as lectotype and has been labelled as such. The remaining ♂ paralectotype has a single small white label with 'MI' (= Melville Island) written in ink. A third specimen (♂) of less certain status has a white label bearing only a black dot. *P. extrema* is here removed from synonymy. *P. nigristriga* has been removed from synonymy by Moulds (1987).

P. melanopygia superficially resembles *P. extrema*, *P. elgneri*, *P. virgulatus*, and *P. vitellinus*. The latter two species have shorter rostrums (extending to mid coxae, compared to hind coxae of *P. melanopygia*), and also clearly distinguishable male pygophore upper lobe shapes (both broadly hooked) compared to the narrower, tapering lobes of *P. melanopygia*. *P. extrema* is distinguished by the black colouration of tergite 7, opercula shape (Figs 5G, 6G), distinct aedeagus structures in male (Figs 5D, 6D), differing lengths of dorsal tymbal ridge (longer in *P. melanopygia*; Figs 5F, 6F), and differing female ovipositor sheath lengths (longer in *P. melanopygia*). See comments under *P. elgneri* for distinguishing features between *P. melanopygia* and *P. elgneri*.

Pauropsalta extrema (Distant) stat.rev. (Figs 6, 56)

Melampsalta extrema Distant, 1892b:323-324

Pauropsalta extrema (Distant) Goding and Froggatt, 1904:619.

MATERIAL EXAMINED

LECTOTYPE: ♂ of *Melampsalta extrema*, here designated, in BMNH: 'syntype' (blue label): '*extrema* Dist': '*Ueana melanopygia* Germ.': 'Roebourne N.W. Aust. Saunders': 'Distant Coll. 1911-383.'

PARALECTOTYPE: ♀, in BMNH: 'Roebourne N.W. Aust.' 'Saunders': 'Distant coll. 1911-383'.

OTHER MATERIAL: 24♂♂, 13♀♀ from following localities. WESTERN AUSTRALIA: Drysdale R. at Kalumburu Rd crossing, Kimberleys; Fortescue R. Hammersley Range; Wyndham, Kimberley Res. St. (MV). Millstream; 0.5 km WNW of Millstream; 2 km ENE of Millstream Hstd; Mt Tom Price, Newman (JM).

Fitzroy R. crossing, Derby-Broome Rd; Halls Ck township; Marble Bar; Millstream, Fortescue R., S of Roebourne; Sherlock R.; Yule R., c. 160 km S of Port Hedland (MSM).

DESCRIPTION

MALE: *Head*: Postclypeus with anterior central broad black shiny fascia centred on midline, and orange to yellow-brown margins; conspicuous rounded yellow-brown spot dorsally on midline; dorsal surface predominantly yellow-brown; silvery pubescence. Anteclypeus black, becoming brown apically; silvery pubescence. Rostrum yellow-brown, extending to hind coxae. Gena and mandibular plate black with intervening suture pallid, as is marginal ridge; silvery pubescence. Antennae pale brown, darker apically. Vertex lobes yellow-brown. Ocelli pink. Eyes dark brown. Dorsal surface of head black with small yellow-brown area over longitudinal suture between ocelli; silvery pubescence especially behind eyes.

Thorax: Pronotum yellow-brown with paler

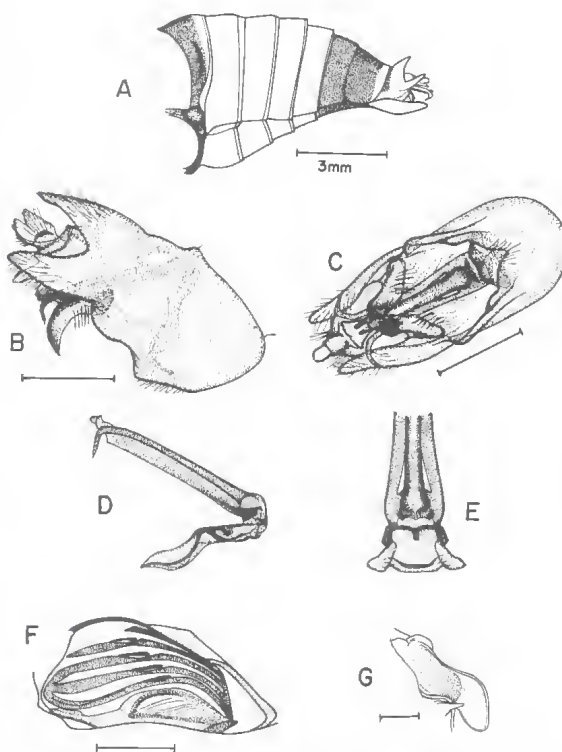


FIG. 6. *Pauropsalta extrema* (Dist.) ♂. Body and opercula from holotype, Roebourne, Western Australia (BMNH); genitalia and tymbals based on specimen from Millstream, Western Australia (JM collection). Symbols A to G, and scales, as in Fig. 2.

central fascia, narrowing posteriorly, but not reaching pronotal collar, and enclosed by deep brown outer rim; broken black to deep brown markings between and close to oblique fissures; anterior margin and pronotal collar pale yellow-brown; pronotal surface uneven with very prominent oblique fissures; sparse silvery pubescence.

Mesonotum dominantly black with a pair of narrow, posteriorly inward curving, orange-brown to yellow-brown dorsolateral fasciae, not reaching cruciform elevation; lateral margins grade from black to brown; cruciform elevation dark brown, becoming yellow-brown along posterior arms.

Legs: Coxae with alternate dark brown and yellow-brown areas, which are longitudinally oriented on fore coxae; femora brown, the colouration paler on hind femora; tibiae and tarsi yellow-brown; claws and spines medium to dark brown.

Wings: Hyaline; costal veins of fore wings pallid, remaining venation pale to medium brown, darker towards apical cells and ambient vein; infuscation spots on hind wings faintly developed.

Tymbals: Dorsal ridge not extending across dorsal inter-ridge sclerite; lower three ridges joined anteriorly; distinct basal spur.

Opercula: Broadly sickle shaped, gently domed in median area, with rounded inward (posterior) terminations; declivous marginal flange around whole margin; bright yellow or orange-brown colouration with variable brown irregular area on median dome; surface finely rugose.

Abdomen: Tergite 2 black to deep brown; tergites 3 to 6 bright orange to yellow; tergites 7 and 8 predominantly black, sometimes with paler posterior margins and small pale dorsal and lateral areas. Sternite II deep brown; sternites IV to VI bright orange to yellow; sternite VII mainly variable brown; sternite VIII orange to orange-brown.

Genitalia: Pygophore brown anteriorly, orange posteriorly; upper lobes elongated, somewhat curved, and acutely terminated; inner and lower lobes conspicuously bulbous; prominent ascending, anteriorly curved claspers, sharp, with complex interdigitated grooves along posterior dorsolateral edges; median process moderately developed; pseudoparameres sharply curved apically, of similar length to endotheca; endotheca cylindrical, nearly straight, with ornamented termination.

FEMALE: Essential markings and colouration as in male. Mesonotum with deep brown rather than

black colouration, and wider and more extensive orange-brown dorsolateral fasciae which coalesce with oblique lateral fasciae adjacent to cruciform elevation; cruciform elevation orange-brown, anteriorly deep brown. Tergites 2 to 6 orange-brown, tending brown on tergite 2; tergite 7 deep brown to black; tergite 8 orange-brown with dark brown to black irregular and variable colouration; tergite 9 orange brown with a pair of longitudinal dark brown dorsolateral fasciae not extending to end of tergite. Sternites orange to orange-brown; ovipositor sheath only extends to posterior margin of tergite 9.

MEASUREMENTS: 19♂ and 12♀. Body length: ♂ 15.2-20.3 (17.93); ♀ 17.3-20.3 (18.82). Fore wing length: ♂ 19.8-25.9 (22.31); ♀ 20.3-25.4 (23.64). Head width: ♂ 4.6-5.8 (5.43); ♀ 5.3-6.1 (5.73). Pronotum width: ♂ 4.8-5.7 (5.12); ♀ 5.1-5.6 (5.40). Abdomen width: ♂ 4.8-6.4 (5.58); ♀ 5.1-6.1 (5.53).

DISTRIBUTION

Occurs widely through the northern zone of Western Australia broadly paralleling the coast, with a gap corresponding to the Great Sandy Desert (Fig. 56).

COMMENTS

In the accessions catalogue in BMNH, item 1911-383 refers to the purchase of the first instalment of Distant Collection (in 1911), comprising 3260 Cicadidae and 2740 moths. Two syntypes of *Melampsalta extrema*, ♂ and ♀, are present in BMNH, the male is selected above as the lectotype. These correspond to the male and female specimens mentioned in the original description, but the original description also indicates the existence of further syntype(s) in AM (not examined).

Although *P. extrema* has been long synonymised with *P. melanopygia* (Distant, 1906b:179), the present study supports their status as distinct allopatric species (see comments under *P. melanopygia*; Fig. 56). *P. extrema* most closely resembles *P. melanopygia*, *P. elgneri* and especially *P. vitellinus*. See comments under *P. melanopygia* and *P. elgneri* concerning distinctions between these species. *P. extrema* is distinguished from *P. vitellinus* by longer rostrum (extending to hind coxae), longitudinally tapering male upper pygophore lobe (booked in *P. vitellinus*), shorter female ovipositor sheath length, and the predominant black colouration of tergite 7.

***Pauropsalta elgneri* Ashton**
(Figs 7, 8A, B, 56)

Pauropsalta elgneri Ashton, 1912a:227, Pl.LI, figs 10a-b; Metcalf, 1963:406; Duffels and van der Laan, 1985:301.

Melumpsalta elgneri (Ashton) Burns, 1957:650.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND: 'C York 1907 Elgner': 'K67569': 'P. elgneri type': 'Ashton Coll.': 'Holotype'. AM.

OTHER MATERIAL: QUEENSLAND: 10 mi. N of Rocky R., Via Coen (QM). Archer R. crossing, 60 km N of Coen; Cape York Peninsula; Peach R., Coen (MSM).

DESCRIPTION

MALE: Head: Postclypeus yellow-brown with anterior broad black central fascia extending along, but much wider than midline, becoming wider dorsally and enclosing a yellow triangular area dorsally on midline; dorsal surface yellow. Anteclypeus mostly dark brown to black, paler dorsolaterally. Rostrum yellow-brown, becoming dark apically, and extending to hind coxae. Gena and mandibular plate black with conspicuous silver-yellow pubescence. Vertex lobes yellow-brown. Ocelli pink to red. Eyes dark brown. Dorsal surface of head black to deep brown, paler adjacent to eyes, with yellow triangular area over longitudinal suture between ocelli; yellowish pubescence especially behind eyes.

Thorax: Pronotum pale brown with pale yellow-brown central fascia, anterior margin, and pronotal collar; small black patches at ends of central fascia, and irregular darker brown patches along and near oblique fissures.

Mesonotum: medium to dark brown laterally and dorsolaterally, with a pair of dark brown dorsolateral to dorsal obconical areas adjacent to pronotal collar, and a dark brown area covered in yellow-silver pubescence, anteriorly to cruciform elevation; remaining dorsal and dorsolateral area yellow-brown; cruciform elevation yellow-brown, with a pair of distinct black spots immediately adjacent to terminations of anterior arms; wing grooves yellow with adjacent silver-yellow pubescence, extending dorsally to cruciform elevation.

Legs: Coxae yellow-brown to brown; femora medium brown, becoming yellow towards tibiae; tibiae and tarsi of fore legs medium brown, becoming yellow-brown on mid and hind legs; claws and spines brown.

Wings: Hyaline; venation yellow-brown to brown, generally darker around apical cells and ambient vein.

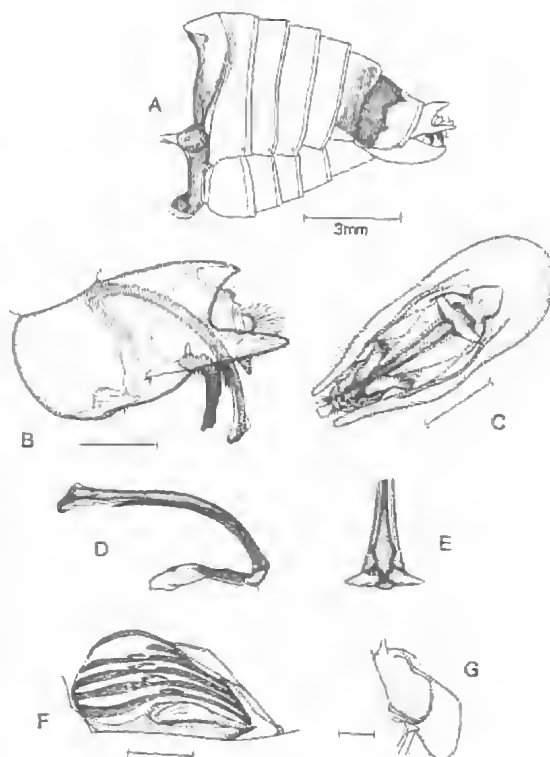


FIG. 7. *Pauropsalta elgneri* Ashton ♂. From specimen from Archer River crossing, 60 km N of Coen, Cape York Peninsula. Symbols A to G, and scales, as in Fig. 2.

Tymbals: Dorsal ridge short and fused posteriorly to adjacent ridge; lower three ridges joined anteriorly; very small basal spur.

Opercula: Broadly sickle-shaped, distinctly bulbous anteriorly; with rounded posterior termination; declivous flange along outer margin; yellow-brown; surface finely rugose.

Abdomen: Tergite 2 yellow-brown, with black zones along anterior and posterior margins which do not extend dorsally; tergite 3 yellow to yellow-brown with narrow black anterior dorsolateral margin; tergite 7 mainly black to dark brown, grading yellow brown anteriorly and dorsally; tergite 8 black anteriorly, otherwise yellow-brown; remaining tergites yellow to yellow-brown. Sternite II mainly deep brown to black; sternites III to VI yellow to yellow-brown; sternite VII yellow to pale brown; sternite VIII pale brown.

Genitalia: Pygophore yellow-brown; upper lobes elongated laterally, relatively acutely

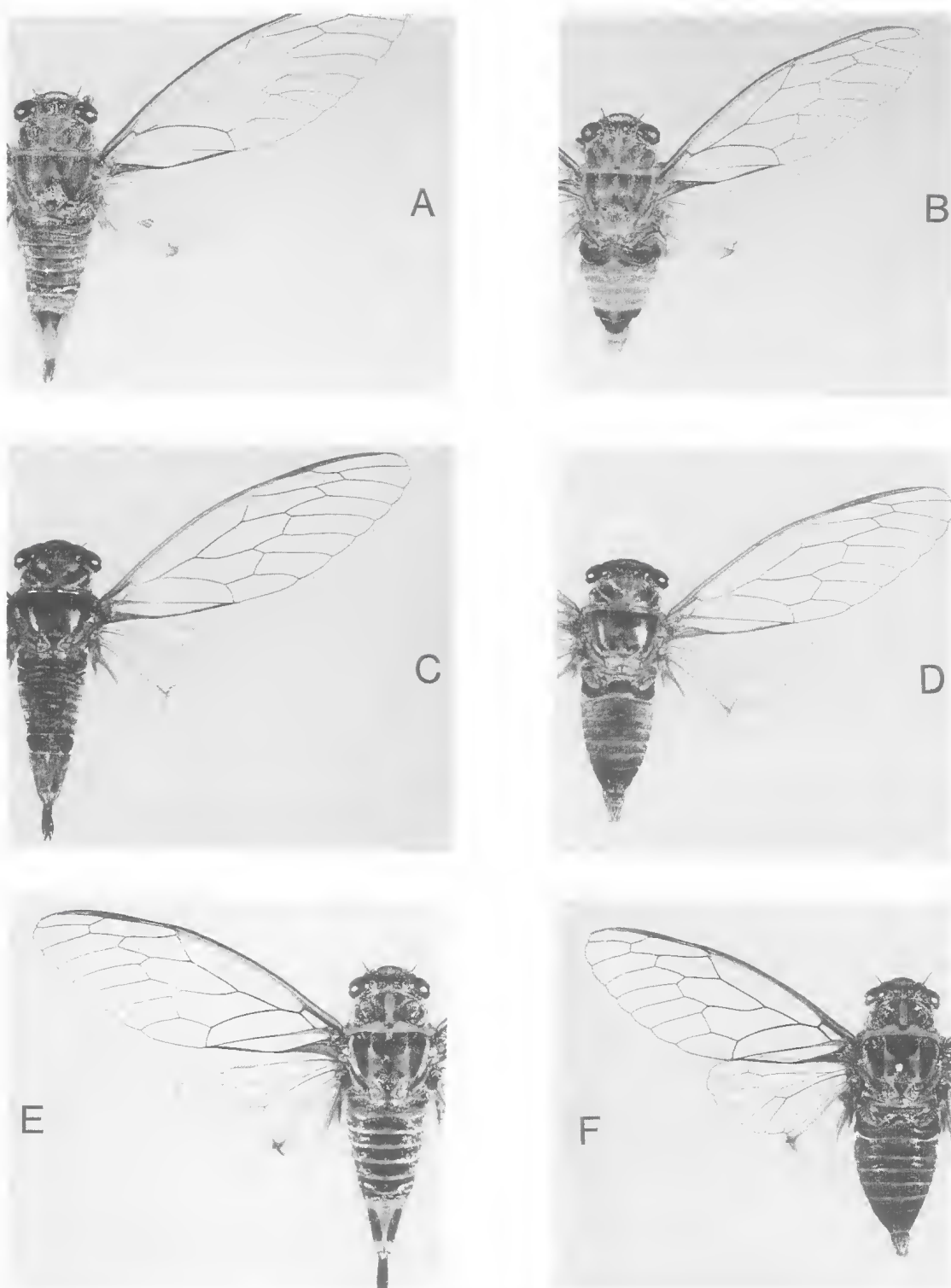


FIG. 8. A,B *P. elgneri* ♀, ♂. C,D *P. vitellinus* ♀, ♂. E,F *P. nigristriga* ♀, ♂. Each photograph x2 natural size.
Photographs: D.M. Reeves

terminated; prominent ascending claspers and ascending median process; curved pseudoparameres shorter than, and terminate dorsally to endotheca; endotheca with flanged and ornamented termination.

FEMALE: Markings and colouration similar to male, tending to brown rather than yellow colouration. Tergites 2 to 8 pale brown with irregular narrow black to dark brown dorsolateral anterior margins, extending laterally in tergite 7; yellow posterior margins to tergites 2-8; tergite 9 mainly pale brown to yellow-brown with a pair of black, clearly defined, anterior dorsolateral fasciae which narrow posteriorly and terminate approximately midway along length of tergite; antero-dorsal area of tergite 9 also dark brown; ovipositor sheath extends approximately 1.5 to 2 mm beyond tergite 9.

MEASUREMENTS: 12♂♂ and 11♀♀. Body length: ♂ 16.8-19.8 (17.87); ♀ 17.8-20.8 (19.26). Fore wing length: ♂ 22.4-25.4 (23.50); ♀ 23.9-26.4 (24.98). Head width: ♂ 5.5-6.4 (5.80); ♀ 5.6-6.5 (5.99). Pronotum width: ♂ 5.0-5.7 (5.25); ♀ 5.1-5.7 (5.39). Abdomen width: ♂ 5.6-6.2 (5.84); ♀ 5.0-5.7 (5.30).

DISTRIBUTION

Northeastern part of Cape York Peninsula, north of approximately Coen, to Cape York (Fig. 56). Occurs in paperbarks and eucalypts along river beds and banks (Moulds, in press).

COMMENTS

Closely resembles *P. melanopygia* and *P. extrema*, from which it is readily distinguished in male specimens by internal genital structures (Figs 5D, 6D, 7D) and the fused two dorsal tymbal ridges characteristic of *P. elgneri* (Fig. 7F). Females of *P. extrema* and *P. elgneri* are distinguished by tergite colouration (orange-brown on tergite 2 to 6, with 7 and 8 black in *P. extrema*; predominantly pale brown on tergites 2 to 8 in *P. elgneri*) and ovipositor sheath lengths (extending >1 mm and 1.5-2 mm beyond tergite 9, respectively). Females of *P. elgneri* and *P. melanopygia* are very similar, the latter differing in the more clearly defined anterior black colouration on tergite 8, orange colouration on sternite II (darker brown in *P. elgneri*), and the more clearly defined black marking on the mesonotum of *P. melanopygia*.

Paurosalta infrasila Moulds (Figs 4C, D, 9, 56)

Paurosalta infrasila Moulds, 1987:18-21, figs 2, 5, 6.

MATERIAL EXAMINED

HOLOTYPE: ♂ Isabella Falls, Bald Hill Stn (= Louisiana Stn) 30 km N of Cooktown, 13.ii.1982 M.S. and B.J. Moulds. (AM). Figured in Moulds (in press) Pl. IX, fig. 2.

PARATYPES: listed in Moulds (1987) from MSM, MV, JM, and AE collections.

OTHER MATERIAL: 4♂♂ from 23.46S 149.06E, 2 km S Horseshoe Lookout, Blackdown Tableland (JM).

DESCRIPTION

MALE: Head: Postclypeus shiny black to deep brown anteriorly with broad orange-brown margin extending inwards between transverse ridges; prominent yellow-brown area dorsally on midline; dorsal surface black around anterior margin and along midline, elsewhere orange-brown; silvery pubescence. Anteclypeus deep brown with silver pubescence. Rostrum pale brown distally, darker apically; extends to hind coxae. Gena and mandibular plate black with intervening suture brown; prominent silvery pubescence. Vertex lobes pale brown. Antennae medium brown. Ocelli pink to red. Eyes dark brown. Dorsal surface of head black with pale brown triangular area on longitudinal suture between ocelli; silver-yellow pubescence especially conspicuous behind eyes.

Thorax: Pronotum brown to orange-brown with broad pale sandy-brown central fascia bordered by sharply defined black rim which widens anteriorly and posteriorly; central fascia narrows and terminates before reaching pronotal collar; anterior margin and pronotal collar pale sandy-brown; irregular broken black markings between and adjacent to oblique fissures; sparse silvery pubescence.

Mesonotum with pair of pale sandy-brown dorsolateral fasciae which widen sharply inwards in median region, almost coalescing; pair of pale oblique broad lateral fasciae, extending into wing grooves, which coalesce with the dorsolateral fasciae near anterior arms of cruciform elevation; cruciform elevation pale yellow-brown, black anteriorly; remaining mesonotum black; margins of fasciae diffuse and irregular when viewed in detail; silver pubescence, especially along wing grooves.

Legs: Coxae dark to medium brown; fore and mid femora dark brown on anterior margins, longitudinal pale and darker brown fasciae on posterior margins; hind femora dark brown distally, paler apically; fore tibiae and tarsi brown; mid and hind tibiae and tarsi pale brown; claws and spines dark brown.

Wings: Hyaline; costal vein of fore wings reddish-brown; remaining venation of fore wings

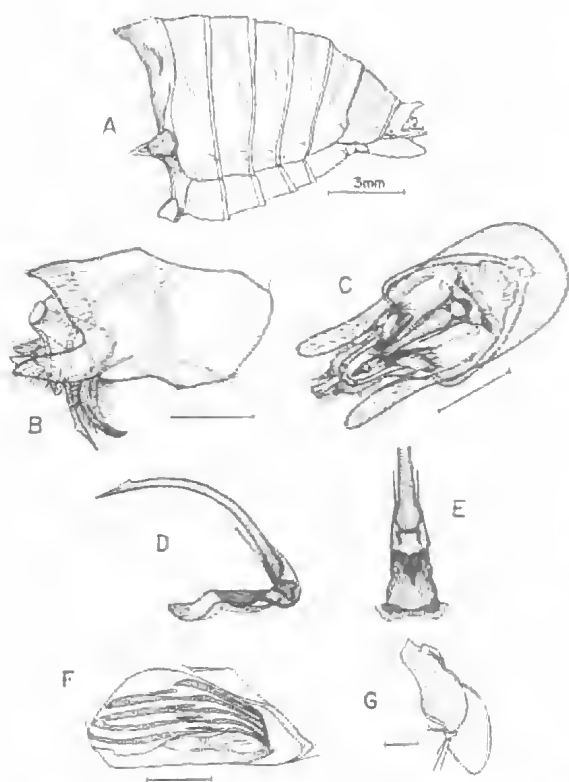


FIG. 9. *Pauropsalta infrasila* Moulds ♂. From specimen from Wrotham Park via Chillagoe, northern Queensland (JM collection). Symbols A to G, and scales, as in Fig. 2.

reddish-brown, becoming brown and darker towards apical cells and ambient vein; venation of hind wings brown. Hind wing infuscation spots faintly developed.

Tymbals: Lower third and fourth ridges joined anteriorly; dorsal ridge not extending across dorsal inter-ridge sclerite; distinct basal spur.

Opercula: Broadly sickle-shaped, relatively narrow, with narrow rounded inner termination; slight medial doming with shiny surface; declivous marginal flange especially developed around outer margin; medium to dark brown anteriorly, pale orange-brown to yellow-brown over posterior half; surface finely rugose.

Abdomen: Tergites 2 to 7 orange-brown with orange posterior margins; tergite 2 with anterior black margin extending around tergite (some specimens showing narrow dorsal discontinuity); tergites 3 to 7 with medium to deep brown median bands extending across dorsal surfaces, narrowing and terminating dorsolaterally; tergite 8 dominantly black to deep brown with anterior

and/or posterior irregular orange-brown margins. Sternite II mainly brown; sternites III to VIII orange-brown with orange posterior margins.

Genitalia: Pygophore brown anteriorly, pale brown over posterior half; upper lobes extended laterally, outwardly curved and somewhat spoon-shaped; prominent ascending and anteriorly curving, narrow claspers; inner and lower lobes not strongly bulbous; median process just visible when pygophore viewed laterally; lateral pair of small, fine, short pseudoparameres which join endotheca close to gonocoxite IX; endotheca curved with barb-like termination as seen in lateral perspective.

FEMALE: Basic markings and colouration as in male, there being some reduction in extent of darker colouration. Head: Upper surface of postclypeus largely pale brown; dorsal surface of head with additional pale dorsolateral areas adjacent to pronotum. Thorax: Mesonotum; dorsolateral pale brown fasciae are broader and coalesce anteriorly, thus producing two intervening distinct black obconical marks. Abdomen: Tergites dominantly brown to orange-brown dorsally, grading laterally to yellow-brown; brown dorso-anterior bands on tergites 3 to 8; tergite 9 with diffuse, broad, dorsolateral dark brown fasciae which extend laterally only three quarters of tergite length, otherwise tergite pale brown grading to yellow-brown posteriorly; ovipositor sheath extends approximately between 1-2 mm beyond tergite 9; sternites dominantly yellow-brown.

MEASUREMENTS: 25 ♂♂ and 21 ♀♀. Body length: ♂ 18.5-24.9 (21.41); ♀ 19.5-22.4 (20.79). Fore wing length: ♂ 22.4-29.5 (25.30); ♀ 23.4-26.2 (25.02). Head width: ♂ 5.7-7.1 (6.31); ♀ 5.8-6.7 (6.23). Pronotum width: ♂ 4.8-6.9 (5.6); ♀ 5.1-6.4 (5.63). Abdomen width: ♂ 5.6-7.1 (6.40); ♀ 5.1-6.1 (5.67).

DISTRIBUTION

Far northeastern Queensland, extending from 27 km E of Forsayth northwards through Chillagoe, the Atherton Tableland through Cooktown northwards to Iron Range, but also found near Weipa, Cape York Peninsula, and Blackdown Tableland, central Queensland (Fig. 56).

COMMENTS

This species is readily distinguished from *P. nigristriga* by the relative shapes of the upper lobes on the male pygophore (extended laterally and acutely terminated in *P. infrasila*, strongly curved 'hook-like' form in *P. nigristriga*), the absence of

black colouration on sternites II and VII in *P. infrasila*, and the relative lengths of the ovipositor sheath in females (extending beyond tergite 9 approximately 1-2 mm in *P. infrasila*; 2.5-3 mm in *P. nigristriga*). *P. infrasila* is closely similar to *P. opacus*, which also overlaps closely in range. These species are distinguished by male genitalia structures (Figs 9B-D, 10B-D), intensity of infuscation on hind wings (very weak in *P. infrasila*), and colouration of tergites (dominantly black to deep brown with pale brown to orange-brown posterior margins in *P. opacus*; predominantly orange-brown in *P. infrasila*).

***Pauropsalta opacus* n.sp.**
(Figs 4E, F, 10, 11, 56)

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND: Bakerville, Q., 11.xii.1972, J.H. Barrett (QM:Reg.No.T.11150).

PARATYPES: QUEENSLAND: 1♀, 1 mi. E of Bakerville, on trunk 'Bloodwood', 13.xi.1974, JDB; 1♂, Ewan Rd, 3-14 mi. W of Paluma, 4-6.i.1966, J.G. Brooks; 1♂ Mareeba, 4.iii.1981, J.T. Moss; 1♂ (damaged), 1♀, Mt Molloy, nr Mareeba, 10.ii.1973, J.T. Moss; 1♂, Paluma, 23.xi.1981, T. Hawkeswood, Dept Forest. Qd Acc. 5248; 2♀♀, Station Ck, nr Mt Carbine, 4.iii.1981, J.T. Moss (JM). 1♀, Clohesy R., 17.i.1974, A. and M. Walford-Huggins; 1♀, Davies Ck Falls, nr Mareeba, 21.i.1982, G. and A. Daniels; 1♀, 10 km E of Davies Ck N.P., nr Mareeba, 550 m, eucalypt woodland, 10.i.1980, A. Hiller; 1♂, Irvinebank, W of Herberton, 29.xii.1982, G. Wood; 1♂, Mareeba, 3.ii.1974, A. and M. Walford-Huggins; 1♂, 1♀, Station Ck, S of Mt Carbine, 27.xi.1979, M.S. and B.J. Moulds; 1♂, Tinaroo Ck Road, nr Mareeba 21.i.1982, G. and A. Daniels, Eucalypt-Casuarina; 1♂, Tinaroo Dam, nr Atherton, 20.xii.1981, J. Olive; 4♂♂, 2♀♀, Tinaroo Lakes, 20.xii.1981, J. Olive; 1♂, Walsh Bluff, 17 km NW Atherton, 30.xi.1986, D.A. Lane; 1♂, Walsh's Pyramid nr Gordonvale, 18.ii.1983, G. Wood (MSM).

ETYMOLOGY

Latin for shady or dim, which refers to general dull appearance of this insect.

DESCRIPTION

MALE: Head: Predominantly black. Postclypeus shiny black anteriorly with pale brown margin, extending slightly between transverse ridges; conspicuous pale brown area dorsally on midline; dorsal surface pale brown; silver-gold pubescence. Vertex lobes pale brown. Anteclypeus shiny black with conspicuous silver pubescence. Rostrum brown, darker apically; extends to hind coxae. Gena and mandibular plate black with narrow marginal pale brown ridge and conspicuous silvery

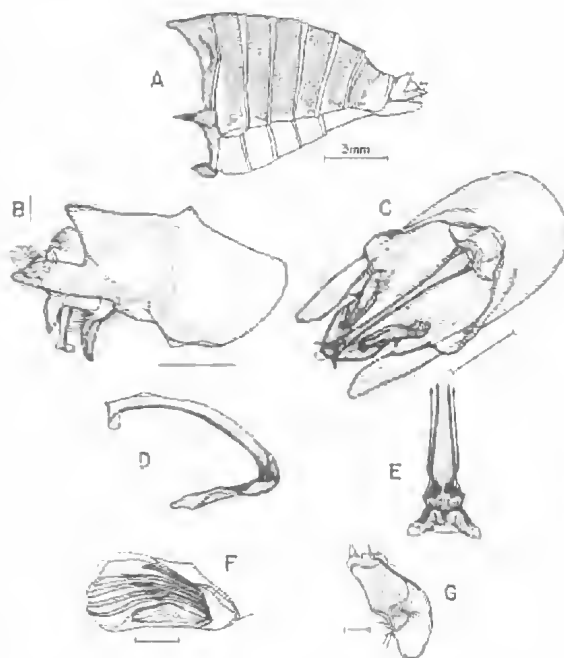


FIG. 10. *Pauropsalta opacus* sp.n., ♂, based on specimen from Ewan Rd, West of Paluma, northern Queensland. Symbols A to G, and scales, as in Fig. 2.

pubescence. Antennae medium brown. Ocelli pink to pale red. Eyes brown. Dorsal surface of head black with triangular pale brown depressed area situated on longitudinal suture between ocelli; two pairs of additional, small pale areas between lateral ocelli and eyes; silvery-gold pubescence.

Thorax: Pronotum dominantly brown with pale brown, spindle-shaped central fascia, not extending to pronotal collar, and enclosed by narrow black envelope; discontinuous black areas adjacent to, and between oblique fissures; pronotal collar pale brown; silvery-gold pubescence.

Mesonotum black with brown dorsolateral fasciae which broaden and join dorsally, extending to cruciform elevation; a pair of oblique broad lateral fasciae which coalesce with the dorsolateral fasciae adjacent to cruciform elevation; cruciform elevation brown; silvery-gold pubescence especially laterally.

Legs: Coxae dark brown; femora dark brown with two broad pale brown longitudinal fasciae on outer margins; fore tibiae brown, mid and hind tibiae paler brown; fore tarsi brown, mid and hind tarsi sandy brown; claws and spines dark brown.

Wings: Hyaline; fore wing venation pale to medium brown, darker towards apical cells; hind wing infuscation spots small but conspicuous.

Tymbals: Dorsal ridge not extending across dorsal inter-ridge sclerite; indistinct basal spur.

Opercula: Relatively narrow, gently undulate, roughly sickle shaped; narrow rounded inward (posterior) terminations, with gentle median dome; shiny and mostly dark brown in anterior and median areas; posterior region pale sandy brown; declivous narrow flange around complete outer margin; surface finely rugose.

Abdomen: Tergite 2 mostly black, in some specimens with narrow reddish-brown zone adjacent to posterior margin; tergites 3 to 7 most commonly black to dark brown becoming pale brown to reddish-brown along lower lateral margins, although sometimes the paler colouration extends upwards along anterior and posterior margins of each tergite; tergite 8 with broad irregular anterior dark band, otherwise pale brown; posterior margins to tergites pale brown to orange-brown. Sternite II mostly black to deep brown with narrow pale brown zone; sternites III to VIII orange-brown; posterior margins of sternites yellow-brown.

Genitalia: Pygophore brown; upper lobes elongated laterally, somewhat spoon-shaped, and relatively acutely terminated; elongated ascending claspers, grooved and gently hooked apically; lower and inner lobes conspicuously bulbous; median process conspicuous and ascending; aedeagus with lateral, relatively short, and very thin pseudoparameres, each with small clavate terminations; endotheca cylindrical, curved, with distinctive tripartite, plate-like termination.

FEMALE: Markings and colouration similar to male. Tergites 2 to 7 mainly black with brown lower areas extending upwards along posterior margins of each tergite; tergite 8 black along anterior margin, but with broad pale brown posterior margin; tergite 9 brown, paler posteriorly, with pair of dorsolateral black fasciae extending laterally and coalescing dorsally at posterior termination of tergite; ovipositor sheath extends between 1-2 mm beyond tergite 9. Sternites III to VI medium brown with orange-brown posterior margins; sternite VII medium brown with black median patches adjacent to ovipositor.

MEASUREMENTS: 14♂♂ and 8♀♀. Body length: ♂ 20.1-22.6 (21.83); ♀ 20.3-26.4 (23.56). Fore wing length: ♂ 24.4-29.2 (26.47); ♀ 25.2-29.2 (27.08). Head width: ♂ 6.1-7.1 (6.39); ♀ 5.8-7.1 (6.57). Pronotum width: ♂ 5.6-6.6 (6.02); ♀ 5.6-6.6 (6.05). Abdomen width: ♂ 6.1-7.0 (6.54); ♀ 5.6-6.6 (6.22).



Fig. 11. Oscillograms of calling song of *P. opacus*, recorded from Mareeba (JM). Records A and B, recorded at the same time scales, show the two song phases. The expanded time scale records (C,D) illustrate the pulse structures of each phase in more detail.

DISTRIBUTION

Atherton Tableland region, from the Herberton area to near Mt Carbine; there is a single specimen from Paluma, north of Townsville (Fig. 56).

COMMENTS

This species is morphologically very close to *P. infrasila*. Distinguishing characteristics are given under *P. infrasila*.

SONG

Consists of two distinct phases (Fig. 11), emitted alternately without pause. The two phases comprise a low frequency song, lasting some 8-9 sec in the available recording, alternating with a higher frequency phase, lasting some 4-5 sec, which exhibits an initial increasing amplitude and a relatively sharp finish. The frequency of the pulse groups constituting the low frequency song are 15-17 Hz, whilst the frequency of the second song phase is estimated to be 195-205 Hz (including both the low and high amplitude pulses), or 98-103 Hz (frequency of higher amplitude pulses only). Both song phases have markedly bimodal pulse amplitudes.

The pulse groups of the low frequency phase comprise four distinct pulses, the second being of higher amplitude; each pulse group is emitted over an interval of approximately 14 msec, with intervals of 5 to 6, 2 to 3, 5 to 6 msec between the four pulses (i.e. the interval between pulses 2 and 3 is shortest).

The pulses of the fast song phase exhibit an alternating sequence of high and low amplitude pulses, virtually evenly spaced, with intervals of approximately 10 msec between the emission of each high amplitude pulse, and approximately 5 msec between each individual pulse.

P. MARGINATA SPECIES-GROUP

This species-group of ten species is the largest within *Pauropsalta* in Queensland. They are all small to small-medium sized (13-19 mm, ♂ body length), and include the majority of the small dark grey to black *Pauropsalta* (previously loosely grouped under the name *P. encaustica*). All species occur in open forest country, are fast flying, and well camouflaged at rest (especially when on tree trunks and major branches, their favoured environments). They occur most extensively through eastern New South Wales and Queensland, on or east of the Dividing Range, with the exceptions of *P. siccanus* and *P. virgulatus*. The male genitalia morphology

suggests that the *P. marginata* group is most closely allied to the *P. annulata* species-group.

Pauropsalta encaustica (Germar)

(Figs 12-15)

Cicada encaustica Germar, 1834:62; Walker, 1850:174; Dohrn, 1859:74.

Cicada arclus Walker, 1850:184; Dohrn, 1859:74; synonymized by Stål, 1862:482,484.

Cicada juvenis Walker, 1850:188; Dohrn, 1859:74; synonymized by Stål, 1862:482.

Melampsalta encaustica (Germar) Stål, 1861:619; Froggatt, 1896:531; Froggatt, 1903:420; Kato, 1932:187; Burns, 1957:651; Greenup, 1966:62-63; Nikitin, 1971:23.

Melampsalta arclus (Walker) synonymised by Stål, 1862:484.

Pauropsalta encaustica (Germar) Goding and Froggatt, 1904:565; Distant, 1906:178; Froggatt, 1907:354; Kirkaldy, 1907:309; Ashton, 1912b:27; Ashton, 1912c:80; Ashton, 1914:355; Hardy, 1918:71; Haupt, 1918:87; Tillyard, 1926:161; McKeown, 1944:234,237; Tiegs, 1955:302-303, Pl. 26, figs 166-169; Metcalf, 1963:406-407; Dugdale, 1972:879; Duffels and van der Laan, 1985:301.

Pauropsalta arclus (Walker) Goding and Froggatt, 1904:565.

MATERIAL EXAMINED

LECTOTYPE: ♂ of *Cicada encaustica*, here designated, in HEC (Hem. Type 785 1/3); 'N.H.' (= New Holland; small white label, written in ink); 'Melampsalta encaustica Germ Named in British Museum by W.W. Fowler 1896. Moreton Bay Australia etc. Distribution]. of sp. in B.M.'.

HOLOTYPE: ♂ of *Cicada arclus* (Fig. 13) in BMNH; three labels on specimen as follows: Green rimmed Type label; '133. *Cicada arclus*' (printed); 'Ent. Club. 44-12'. Reference to the BMNH accession catalogue indicates that the number 44-12 refers to 1844, item 12, which details various insect groups (including 100 Homoptera) presented by the Entomological Club. No locality data are given.

HOLOTYPE: ♂ of *Cicada juvenis* (Fig. 13) in BMNH; three labels on specimen as follows: Green rimmed Type label; '138. *Cicada juvenis*' (printed); '44 105' (one side of small white label), 'N.H. Pt. Steph' (reverse side of label). Reference to BMNH accession catalogue indicates that 44 105 refers to 1844, item 105, comprising 19 Homoptera (plus other insect groups), presented by the Earl of Derby, collected by Macgillivray. The label abbreviations N.H. and Pt. Steph refer to New Holland and Port Stephens, respectively.

OTHER MATERIAL: 19♂♂, 3♀♀ from following localities. NEW SOUTH WALES: Bells Line Rd, nr Mt Wilson turnoff, Blue Mts; Glenbrook; Loftus (nr Royal National Park); Mt Westmacot, W of Royal National Park; Sutherland, nr Royal National Park; Warragamba Dam; Water Fall (Royal National Park) (JM). Stanwell Park (AE).

DESCRIPTION

MALE: Head: Postclypeus; shiny black anteriorly with well defined pale red-brown margin and small spot dorsally on midline; dorsally black; silver-yellow pubescence. Anteclypeus black. Rostrum pale distally, becoming dark brown-black apically; extends to mid coxae. Gena and mandibular plate black, with pale marginal ridge and intervening suture; silvery pubescence. Antennae black. Ocelli pink. Eyes brown. Vertex lobes red. Dorsal surface of head black with pale triangular area on longitudinal suture between ocelli; short yellowish pubescence.

Thorax: Pronotum black with brown anterior margin and pronotal collar, and narrow brown central fascia not reaching margin of pronotum; short yellowish pubescence.

Mesonotum dominantly black with reddish-brown dorsolateral fasciae, widening inwards (dorsally), and extending to anterior arms of cruciform elevation, which is also reddish brown; wing grooves red-brown to pale brown, with conspicuous adjacent pale pubescence.

Legs: Coxae black, with reddish-brown margins on fore coxae; fore femora black, grading to brown (hind femora), with longitudinal red-brown fasciae on fore femora, and pale red-brown terminations on mid and hind femora; tibiae, tarsi, and claws brown, become paler on hind legs.

Wings: Venation brown, becoming darker around apical cells and ambient vein. Hind wing infuscation spots distinct.

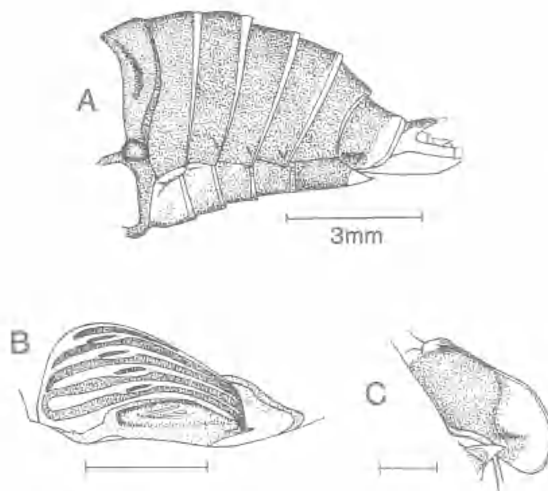


FIG. 12. *Pauropsalta encaustica* (Germ.), lectotype, ♂, in HEC. A: Abdomen, viewed laterally from left side. B: Left tymbal. C: Left opercula.

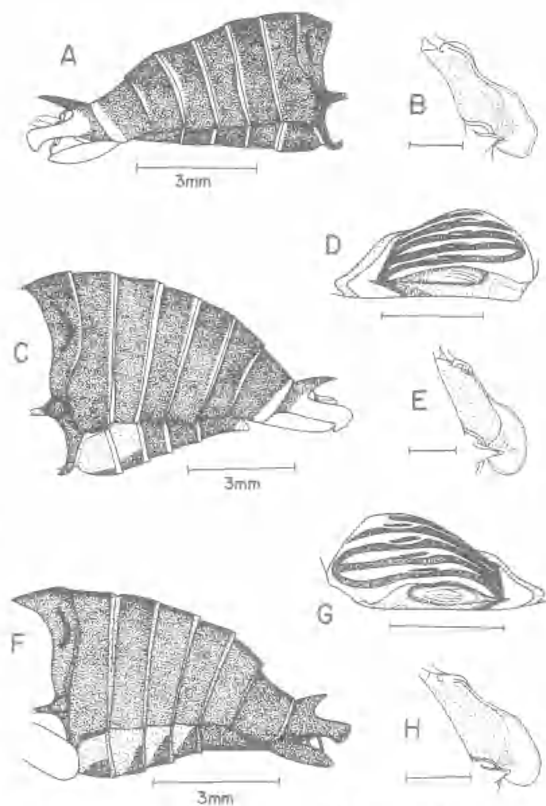


FIG. 13. A,B: *Cicada arclus* Walker: Holotype, ♂, BMNH, showing abdomen and opercula. C-E *Cicada juvenis* Walker: Holotype, ♂, BMNH, showing abdomen, tymbal, and opercula. F-H: *Pauropsalta dolens* (Walker): Holotype, ♂, BMNH, showing abdomen, tymbal, and opercula. Scales represent 1 mm, except where otherwise indicated.

Tymbals: Dorsal ridge extends across dorsal inter-ridge sclerite; the two (in some specimens, three) lower ridges joined anteriorly; indistinct basal spur.

Opercula: Roughly sickle-shaped, broadly undulate, but not domed; black anteriorly, pallid around outer margin and posteriorly; declivous outer flange; inner (posterior) termination rounded; surface finely rugose.

Abdomen: Tergites dominantly black, with pale yellow-brown posterior margins; tergites 7 and 8 have paler yellow-brown posterior margins, which narrow dorsally; in some specimens, tergites 2 to 6 have narrow irregular dorsolateral red-brown zones adjacent to posterior margins. Sternites II to VII dominantly deep brown to black, with paler dorsolateral area on sternite III, and pale brown

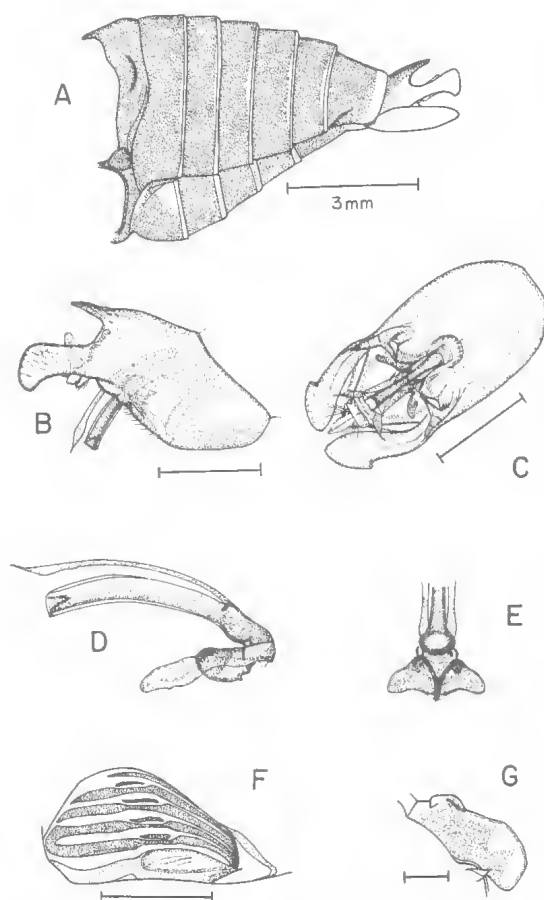


FIG. 14. *Pauropsalta encaustica* (Germar) ♂, based on specimen from Loftus, near Royal National Park, Sydney (JM). Symbols A to G, and scales, as in Fig. 2.

near posterior margin on sternite VII; sternite VIII pale reddish-brown; posterior margins of sternites pale yellow-brown.

Genitalia: Pygophore black dorsally, otherwise pale brown, with the pale brown to pallid, sub-ascending and hooked upper lobes especially prominent. Aedeagus with dorsal pseudoparameres slightly longer than endotheca; endotheca cylindrical, curved, with apical pair of lateral wing-like processes which taper towards base.

FEMALE: Colouration and markings closely similar to male, with slight overall increase in extent of paler areas of colouration. Central fascia on pronotum more prominent; dorsolateral red-brown fasciae on mesonotum more extensive centrally. Legs: Femora, tibiae, and tarsi paler than in male, with distinct brown longitudinal

fasciae on femora, which are broadest on fore femora. Abdomen: Tergites 2 to 8 dominantly black, with more clearly developed red-brown zone adjacent to posterior margins, narrowing dorsally; tergite 9 black dorsally and anterio-dorsally, otherwise pale brown with near central black spot; ovipositor sheath extends only to termination of tergite 9, or very slightly beyond. Sternites black on median and anterio-median areas, otherwise pale yellow-brown.

MEASUREMENTS: 19♂♂ and 3♀♀. Body length: ♂ 13.5-16.3 (14.52); ♀ 14.5-16.3 (15.32). Fore wing length: ♂ 14.7-18.3 (16.79); ♀ 15.7-19.3 (17.61). Head width: ♂ 4.2-5.0 (4.66); ♀ 4.6-5.3 (4.98). Pronotum width: ♂ 3.5-4.2 (3.91); ♀ 3.8-4.3 (4.13). Abdomen width: ♂ 3.8-4.6 (4.20); ♀ 3.7-4.6 (4.23).

DISTRIBUTION

The Sydney region, especially the Hawkesbury Sandstone area, extending north to Port Stephens.

COMMENTS

Two syntypes are identified at HEC (Ewart, in press). The male (Fig. 12) with the Fowler label is selected as lectotype and has been labelled as such. The reference to Moreton Bay on the Fowler label, however, is considered erroneous. The upper pygophore lobes and beak are slightly damaged. A second paralectotype, conspecific with the lectotype, has a single white label: 'VDL' (handwritten in black ink).

Cicada arclus Walker, *C. juvenis* Walker, and *C. dolens* Walker were synonymized by Stål (1862:482,484) with *C. encaustica* Germar and this decision was followed by subsequent workers (e.g. Goding and Froggatt, 1904; Distant, 1906b; Metcalf, 1963; Duffels and van der Laan, 1985). The holotype ♂ of *Cicada dolens* (Fig. 13) is also held in BMNH, and bears the following three labels: Green rimmed Type label; '140 *Cicada dolens*' (printed); '40 12.16 257.' (handwritten on small white label). These numbers refer to the acquisition date (16th of 12th month, 1840), Item 257. The BMNH accession catalogue show it to come from New Holland, King Georges Sound, presented by Capt Grey. (Examined).

Examination of the types (Figs 12-13) of *Cicada encaustica* Germar, *C. arclus* Walker, and *C. juvenis* Walker indicates that they are conspecific. *Cicada dolens* Walker, however, is not conspecific with *C. encaustica* Germar (Figs 12,13), and is listed in this work as a valid species. It is not described in detail as the type locality is SW Australia.

P. encaustica is very close morphologically to

P. fuscata. The males are readily distinguished by the colouration of the upper lobes of pygophore, which are pallid to pale brown in *P. encaustica* and black in *P. fuscata*; song patterns are characteristic (Figs 15,23). Females are especially difficult to distinguish morphologically, only the slightly more extensive blacker colouration on tergite 9, the larger size, and the more conspicuously red-brown coloured zones adjacent to posterior margins along tergites 2-8 in specimens of *P. encaustica* are useful, but not wholly diagnostic criteria.

SONG

Oscillograms are shown for two individual Sydney insects, at low film speeds (i.e. low resolution), based on tapes provided by Dr. J. Moss (Fig. 15). The two songs differ slightly, one (A) consisting of discrete groups of pulses (phrases), the second (B) an essentially continuous train of pulses. The pulse repetition frequency is similar in both, between 11.3-12.9 Hz in A, and 10.3-10.5 Hz in B. In the song shown in Fig. 15A, the phrases consist of between 7 to 13 pulses, with intervals of between 0.4-0.5 sec between phrases, each of these interphrase intervals being characterised, nearly midway between each interval, by the emission of a group of 3 to 4 very closely spaced, overlapping pulses. Although the oscillograms (Fig. 15) cannot be closely resolved, it is evident that each pulse that makes up the main unit of the song patterns constitutes a more complex pulse group.

Pauropsalta corticinus n.sp. (Figs 16,17,18A,B,57)

Pauropsalta species A Ewart, 1986: 51-54, fig. 3A.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND: Beerburum, c. 60 km N of Brisbane, 17.ii.1978, song recorded, A. Ewart (QM; Reg. No. T.9185).

PARATYPES: QUEENSLAND: 2♀♀, Ban Ban Range via Coalstoun Lakes, 5.ii.1975, H. Frauca; 1♂, Biggenden, Bluff Range foothills, 1-7.i.1972, H. Frauca; 1♂, Brisbane, W.W. Froggatt Collection; 1♂, Mt Walsh N.P., 7 km SE of Biggenden, 17.ii.1978, H. Frauca; 2♀♀, 27.33S 151.59E, Prince Henry Heights, 620m, Toowoomba, 7.i.1983, I.F.B. Common, 2♂♂, 10.i.1983 (ANIC); 1♂, 1♀ Doolandella, Brisbane, 12.xii.1981, to light (BMNH). 1♂, Doolandella, Brisbane, 9.x.1983, A.E., 1♀, at light, 11.xii.1981 (MNDN); 1♀, Brisbane, 26.xii.1927, A.N. Burns; 1♂, Brisbane, 5.i.1928, A.N. Burns; 1♂, Brisbane, 11.iii.1930, A.N. Burns; 1♂, Brisbane, 7.xi.1951, R. Dobson; 4♂♂, 3♀♀, Brisbane, 8.ii.1954; 1♂, Brisbane, 9.iii.1954, J. Kerr; 2♂♂,

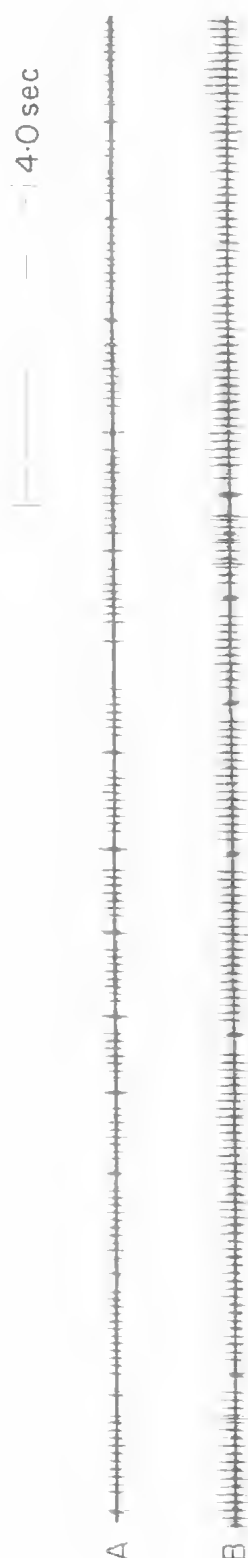


FIG. 15. Oscillograms of two sets of calling songs of *P. encaustica*, recorded at Sutherland and Loftus, Sydney (JM).

Brisbane, 17.x.1954, J. Kerr; 8♂♂, 2♀♀, Brisbane, 27.xi.1955, J. Kerr; 1♂, Brisbane, 13.iii.1955, J. Kerr; 1♂, Brisbane, 21.i.1956, J. Kerr; 1♂, Brisbane, 26.xii.1956, J. Kerr; 1♂, Brisbane 28.xii.1956, J. Kerr; 1♂, 2♀♀, Brisbane, 15.i.1957, J. Kerr; 1♀, Brisbane, 16.i.1957, J. Kerr; 3♀♀, Brisbane, 2.ii.1957, J. Kerr; 2♀♀, Brisbane, 15.i.1959, J. Kerr; 1♂, 1♀, Brisbane, 1.i.1959, JK; 2♂♂, 1♀, Brisbane, 27.xii.1959, J.K.; 1♀, Brisbane, 9.i.1960, J.K.; 1♂, Brisbane, 2.i.61, JK; 1♂, 1♀, Brisbane, 26.xii.1961, JK; 1♀, Burleigh Heads, 3-4.i.1956, J. Kerr; 1♂, Caloundra, xi.1959, JK; 2♂♂, Coolum, iii.1954, GL; 1♂, Glen Aplin, 28.x.1945, A.G.; 2♂♂, 2♀♀, Mt Cooth-tha, 14.xi.1954, J. Kerr; 1♀, Mt Cooth-tha, 12.iii.1955, J. Kerr; 1♂, Mt Emlyn, 3.xii.1955, J. Kerr; 1♀, Mt Glorious, 3.i.1960, J.K.; 1♂, Mt Tamborine, i.1958, C. King; 1♀, Noosa Hds., 6.x.1955, AB; 1♂, Palmwoods, 24.ix.1955, AB; 1♂, Stanthorpe, 15.i.1957, J. Kerr (MV). 2♂♂, 1♀, Brisbane, 20.xi.1911, H. Hacker; 1♂ Brisbane, 27.xi.1911, H. Hacker; 3♂♂, Brisbane, 16.xi.1912, H. Hacker; 3♂♂, Brisbane, 3.ii.1913, H. Hacker; 1♂, Brisbane, 14.x.1913, H. Hacker; 1♂, 1♀, Brisbane, 15.ii.1916, H. Hacker; 1♂, Brisbane, 16.x.1921, H. Hacker; 2♂♂, Brisbane, 7.xi.1921, H. Hacker; 1♂, Brisbane, 16.x.1923, H. Hacker; 2♀♀, Brisbane, 23.x.1969, J.L. Wilson; 1♂, Brisbane, 26.xi.1969, A. Hiller; 1♀, Kilcoy, 18.ii.1954, S. Gunn; 1♀, Stradbroke Is., 3.xii.1912, H. Hacker (QM). 1♂, 1♀, Amiens S.F. nr Stanthorpe, 22.xi.1980, G. Daniels and M.A. Schneider, 2♂♂, 24-26.xi.1981; 1♂, Gatton, 3.iv.1956, C.A. Muir; 1♂, Mt Marley, nr Stanthorpe, 26.xi.1981, G. Daniels and M.A. Schneider; 1♂, Planted Ck, via Tansey, 12.xii.1976, G.B. and S.R. Monteith; 1♂, Stanthorpe, 27.i.1927; 1♂, Tamborine Mt, C. Deane; 1♂, Towba (= Toowoomba), 9.ii.1920, J.A. Beck (UQIC). 2♂♂, 1♀, Booyal nr Childers, 1.ii.1973, J.T. Moss; 1♂, 3♀♀, Borumba Dam nr Imbil, 26.i.1980, J.T. Moss; 1♀, Brookfield, Brisbane, 8.i.1973, J.T. Moss; 2♂♂, 1♀, Hervey Bay, 24.x.1982, J.T. Moss; 6♂♂, 3♀♀, Leslie Dam via Warwick, 18.xi.1984, J.T. Moss; 2♂♂, Mt Morgan, 16 km E, 1.i.1973, J.T. Moss; 1♂, Mt Walsh N.P., nr Biggenden, 19.ii.1979, J.T. Moss; 1♀, 28.14S 153.08E c. 1 km W of O'Reilly's, Lamington N.P., 6.xi.1971, C.H.L. Key; 2♂♂, 1♀, Somerset Dam, nr Kilcoy, 30.xii.1973, J.T. Moss; 1♂, Somerset Dam nr Kilcoy, xii.1983, J.T. Moss; 1♂, Stanthorpe, 24-25.xii.1983, J.T. Moss; 4♂♂, 4♀♀, Widgee Ck on Burnett Hwy nr Gympie, 2.xii.1981, J.T. Moss; 2♂♂, Woolooga nr Gympie, 20.ii.1973, J.T. Moss; 1♂, Yandina, via Nambour, 3.i.1974, J.T. Moss (JM). 1♂, Amiens, 1.xii.1985, R. Eastwood; 1♂, Mt Beerburum, 6.xii.1985, R. Eastwood; 1♀, Beerwah, 24.i.1986, R. Eastwood; 2♂♂, 1♀, Boreen Pt, Cooloolo, 9.xi.1980, R. Eastwood; 3♂♂, Caloundra, 15.xi.1978, R. Eastwood; 1♂, Camira, Brisbane, 7.ix.1983, J.T. North; 1♂, Carindale, 26.ix.1984, B. Montgomery; 1♂, Coolum Heights, 21.x.1986, R. Eastwood; 1♂, 1♀, Doolandella, Brisbane, 12.xii.1981, A. Ewart; 1♂, Elanda Pt, L. Cootharaba, 26°14'S 153°00'E, 2.ii.1986, G. and A. Daniels; 3♂♂, 5♀♀, Elanda Pt to Kin Kin Ck, 26°14'S 153°00'E, 17.xi.1985, G. and A. Daniels; 1♂, Fairlies Knob, 57Km W Maryborough, 24.i.1987, R. Eastwood; 1♂, The Gap, 28.ix.1980, P. Herbert; 1♂,

Goomburra S.F., 35 km E of Allora, 21.xii.1981, coll. unknown; 1♂, 4♀♀, c. 16 km S Gympie, 3.ii.1973, A. and M. Walford-Huggins; 1♂, Hodgson Vale, nr Toowoomba, 15.iii.1981, J. North; 1♀, Jamboree Heights nr Brisbane, 14.x.1979, G. Daniels; 1♂, Jimna, N of Kilcoy, 17.xii.1979, A. Hiller; 2♂♂, 2♀♀, Kinbombi Falls nr Goomeri, 19.xii.1976, M.S. and B.J. Moulds; 1♂, Kroombit Tops, N of Monto, 14.x.1983, G. Theischinger; 1♂, Leyburn, 27.i.1985, C.E. Hagan; 1♀, Maroochydore, 1.ii.1986, R. Eastwood; 1♀, Mt Cooth-tha, nr Brisbane, 3.i.1977, G. Daniels; 1♂, Mt Glorious, 635 m, rainforest, 22 km NW Brisbane, xii.1982, Anthony Hiller; 2♂♂, Mt Marlay, Stanthorpe, 4.ii.1984, G. and A. Daniels; 2♂♂, Mt Marlay, Stanthorpe, 22.xii.1986, R. Eastwood; 3♀♀, Mt Moffat N.P., Kenniff's Lookout, 13.xii.1987, Monteith, Thompson, and Yeates; 2♂♂, 2♀♀, Mt Moffat N.P., Mahogany Forest, 1000 m, 11-12.xii.1987, Monteith, Thompson, and Yeates; 10♂♂, 6♀♀, Mt Moffat N.P., Top Shelter

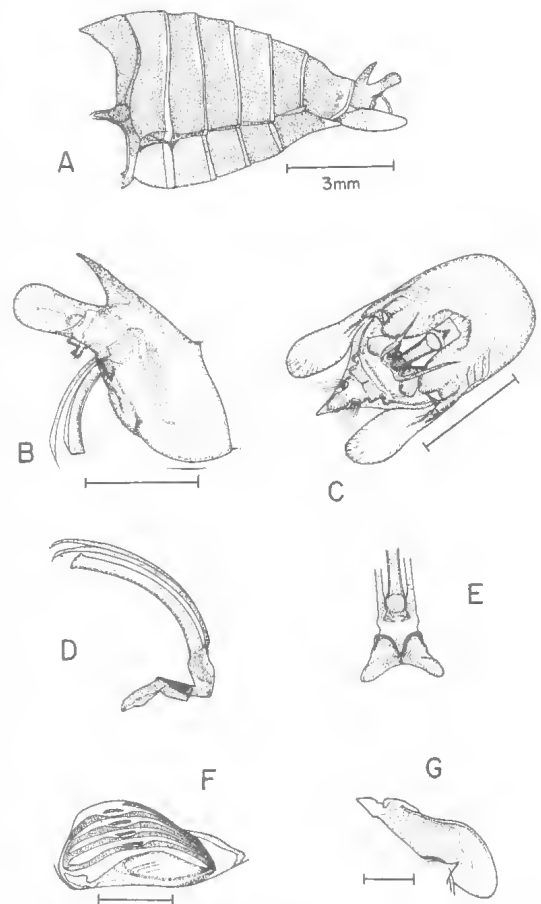


FIG. 16. *Pauropsalta corticinus* sp.n., ♂, based on specimens from southwestern Brisbane and the Bunya Mts, southern Queensland. Symbols A to G, and scales, as in Fig. 2.

Shed, 1000 m, 10-12.xii.1987, Monteith, Thompson, and Yeates; 1♂, Mt Moffat N.P., Top Moffat Camp, 13-15.xii.1987, Monteith, Thompson, and Yeates; 1♂, Mt Tibberoowuccum, Glasshouse Mts, 12.ii.1984, open eucalypt forest, C.E. Hagan; 1♂, Nambour, 3.i.1978, R. Eastwood; 1♂, 1♀, Noosaville, 26.x.1984, R. Eastwood; 1♂, Redcliffe, Brisbane, 15.x.1983, J. North; 1♂, Saltwater Ck, Maryborough, 22.xi.1986, R. Eastwood; 1♂, St Lucia, 10.x.1980, R. Monks; 1♂, St Lucia, Brisbane, 20.x.1983, J. North; 1♂, St Lucia, Brisbane, 17.x.1985, C. Peart; 1♀, Tallebudgera Ck, 15-20 km SSW of Burleigh Heads, 19.x.1980, D.J. Cook; 1♂, Toowong, 2.xi.1982, J. North; 2♂♂, Toowoomba, 8.xii.1979, M.S. and B.J. Moulds; 1♂, 1♀, Toowoomba, 20.xii.1984, I.F.B. Common; 1♀, Ugly Gully, nr Mt Crosby, 13.iii.1981, G. Daniels; 1♂, Wallangarra, nr New South Wales border, 23.iv.1978, M.S. and B.J. Moulds; 4♂♂, Warwick, 18.xi.1962, M.S. Moulds; 1♂, West Coolumb, 11.xii.1986, R. Eastwood; 3♂♂, 1♀, Yelarbon, 11.xi.1973, M.S. Moulds (MSM). 1♂, Agnes Waters, 5.ii.1984, A.E.; 1♂, Allawah, Mt Crosby, 30.xi.1975, A.E.; 1♀, Beerburrum, 17.ii.1978, A.E.; 1♂, Boonah Rd turnoff, W Ipswich, 2.xi.1980, A.E.; 2♂♂, Brisbane Forest Park, xi.1982, R. Leggatt; 1♂, Brookfield, i.xii.1975, A.E.; 3♂♂, 1♀, Bunya Mts, 16.xii.1976, A.E.; 1♂, 1♀, Burnett Ck, Mt Maroon, 16.xi.1975, A.E.; 1♂, Cambells Folly (Mt Lindsay), 12.xi.1971, A.E.; 6♂♂, 1♀, Carnarvon Lodge, Carnarvon N.P., 8-12.xii.1985, J.T. Moss and A.E.; Doolandella, Brisbane, A.E., as follows, 1♂, 18.x.1981; 2♂♂, 1♀, 12.xii.1981; 1♂, 1♀, 9.ii.1982; 2♂♂, 17.ii.1982; 1♂, 14.iii.1982; 1♂, 11.ii.1983; 1♂, 1♀, 13.ii.1983; 1♂, 14.x.1983; 4♂♂, 9.xi.1983; 5♂♂, 4♀♀, 'Iron Bark', Crows Nest, 22.xi.1975, A.E.; 1♂, Ivory Rk, S of Ipswich, 29.i.1972, A.E.; 2♂♂, 4♀♀, Jacobs Well, 3.iii.1978, A.E.; 2♂♂, Jacobs Well, 7.iii.1978, A.E.; 7♂♂, Kroombit Tops, Forestry Barracks, 12.xii.1983, A.E.; 2♀♀, Kroombit Tops, Kroombit Ck, 16.xii.1983, A.E.; 10♂♂, 7♀♀, Kroombit Tops, northern escarpment, 16.xii.1983, A.E.; 1♂, 1♀, Kroombit Tops, Lower Ck, TA47, 17.xii.1983, A.E.; 1♂, 1♀, Base of Mt Coolumb, 17.x.1981, A.E.; 2♂♂, Mt Crosby, 8.iii.1981, A.E.; 1♂, Pt Elanda, L. Cootharaba, 15.xii.1978, A.E., 1♂, 17.xii.1978; 1♂, Samford (S.F.), 6.xii.1975, A.E.; 1♂, Swanbank, nr Ipswich, 23.ix.1978, A.E.; 1♂, Tarragindi, 3.iii.1978, D. Reeves, 1♂, 7.x.1978, D. Reeves, 1♀, 19.xii.1978, 1♂, 24.ii.1979, 1♂, 12.xii.1980 (AE). NEW SOUTH WALES: 1♂, Tenterfield, 1906, W.W. Froggatt (ANIC). 1♂, Cabramatta, 25.xii.1957, M.I.N.; 3♂♂, 1♀, Cabramatta, 9.xi.1958, MN; 1♂, Cabramatta, 1.xii.1960, M.I.N.; 1♂, Cabramatta, 7.i.1962, MN; 1♂, Cabramatta, 29.xi.1962, MN; 1♂, Fairfield, 20.x.1959, F. Edwards, 1♂, iv.1960; 4♂♂, Goodman's Ford, Wollondilly R., 9.xii.1954, RD.; 1♂, Windsor, 30.x.1952, RD.; 6♂♂, 2♀♀, Windsor, 9.xi.1952, RD. (MV). 2♂♂, 14 mi. S from Bonshaw on Glen Innes Rd, 11.xi.1973, M.S. Moulds; 2♂♂, Bungonia, 13.x.1973, G.R. Brown; 1♂, Failford, nr Taree, 7.i.1972, M.S. Moulds, 1♂, 8.i.1972; 3♂♂, 1♀, 9.i.1972; 1♀, c. 40 km N of Kyogle, on The Risk road, nr Qd border, 16.xii.1976, M.S. and B.J. Moulds; 2♂♂, Landsdowne, nr Taree, 27.xi.1980, M.S. and B.J. Moulds; 1♂, Mann

R. 5 km upstream from old Glen Innes-Grafton Rd crossing, 26.xi.1977, M.S. and B.J. Moulds, 3♂♂, 2♀♀, 16.xi.1981; 2♂♂, 2♀♀, Menai, W of Sutherland, Sydney, 14.xi.1983, R. Eastwood (MSM).

OTHER MATERIAL: QUEENSLAND: 1♂, Innisfail, 1957, A. Gillison (UQIC). This specimen is well beyond the normal range of *P. corticinus* and the record requires confirmation. VICTORIA: 3♂♂, Kyambram, 1947, J.C. Le Souef; 1♂, Mooroopna, 1.i.1924, F.E. Wilson; 1♂, Nagambie, 19.xi.1932, A.B.; 1♂, Nagambie, 17.xii.1932, A.B. (MV). Although these specimens are morphologically very similar to *P. corticinus*, there is some doubt regarding their correct identity, which may need to be confirmed by song data.

ETYMOLOGY

Corticinus derived from the Latin *corticus*, abounding in bark (of tree).

DESCRIPTION

MALE: *Head:* Predominantly black. Postclypeus shiny black anteriorly with narrow pale brown margin; rounded pale brown spot dorsally on midline; marginal silver pubescence; dorsal surface black with pale brown lateral margins and scattered short yellow-brown pubescence. Anteclypeus shiny black with conspicuous silver pubescence. Rostrum medium brown, becoming black apically; extends to mid coxae. Gena and mandibular plate black, with intervening pale brown suture and triangular area adjacent to postclypeus; conspicuous silver pubescence. Antennae deep brown. Ocelli pink-red. Eyes dark brown. Dorsal surface of head black with semicircular pale brown depressed area situated on longitudinal suture between ocelli; conspicuous silver pubescence behind eyes. Vertex lobes pale brown.

Thorax: Pronotum black with pale brown to ochraceous spindle-shaped central fascia, not extending to anterior or posterior pronotal margins; a pair of ochraceous dorsolateral asymmetric triangle-shaped areas adjacent to pronotal collar; short yellowish pubescence, especially adjacent to oblique fissures; pronotal collar pale reddish-brown.

Mesonotum black, with pair of pale to medium brown dorsolateral fasciae which broaden and nearly coalesce in median area; cruciform elevation pale brown, except for small black lateral patches; silver-yellow pubescence especially conspicuous around cruciform elevation and along pale brown wing grooves and adjacent ridges.

Legs: Coxae black with pale sandy-brown to brown fascia along margins; femora pale brown to reddish-brown with dark brown broad, longitudinal fasciae, and silver-yellow pubescence;

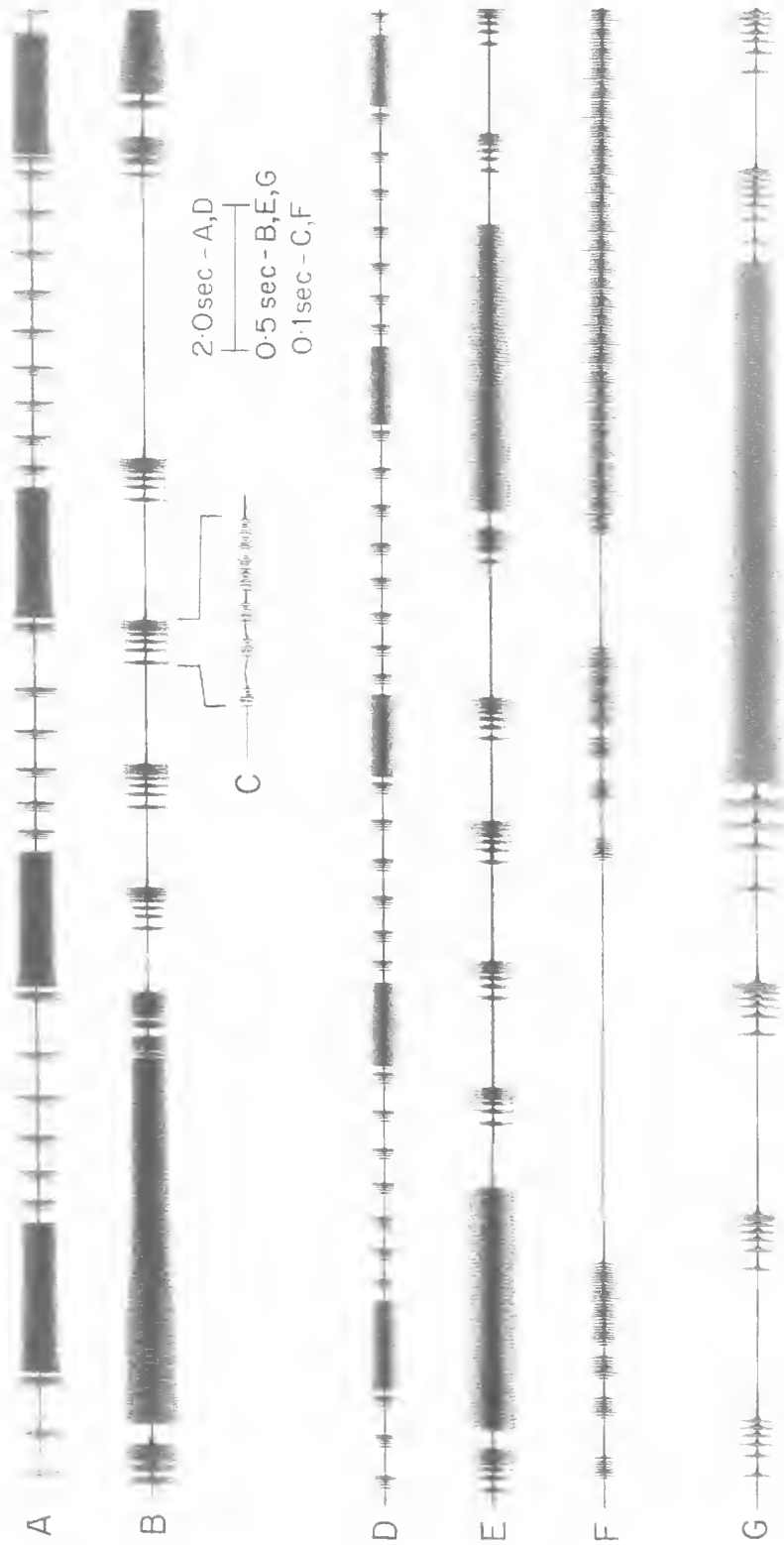


FIG. 17. Oscillograms of three sets of calling songs of *P. coriicinus*, from Beerburum (north of Brisbane; A to C, Feb. 1978), Kroombit Tops (eastern central Queensland; D to F, Dec. 1983), and Carnarvon Gorge, central southern Queensland; G, Dec. 1985). Records shown at three different time scales, as illustrated on scale; B, E and G, for example, are run on same scale, and thus can be directly compared.

fore and mid tibiae dark brown, paler brown on hind tibiae; fore tarsi dark brown, becoming paler on mid and hind tarsi, claws and spines dark brown.

Wings: Fore wing venation castaneous, becoming darker distally towards apical cells and ambient vein; fore wing costal veins brown. Infuscation spots on hind wings conspicuous, spreading out from, and adjacent to the distal end of the 2A vein, along distal margin of anal lobe.

Tymbals: Two or three lower ridges joined anteriorly; dorsal ridge does not extend across dorsal inter-ridge sclerite; distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated and posteriorly rounded; relatively shiny and domed medially; declivous marginal flange, most conspicuous along outer margin; colour mostly black to deep brown over anterior and medial areas, pale yellow-brown along posterior marginal region; surface slightly rugose.

Abdomen: Tergites black with pale yellow to yellow-brown posterior margins; distinct dorsolateral to lateral reddish-brown bands adjacent to posterior margins of tergites 3 to 6, with similar, but paler bands on tergites 7 and 8, becoming broader and more irregular on 8; sparse silver pubescence most conspicuous dorsolaterally and laterally. Sternites dark brown to black, becoming slightly lighter towards sternites III and IV; posterior margin of each sternite pale yellow-brown; lateral silver pubescence; sternite VIII dark brown anteriorly, paler coloured posteriorly.

Genitalia: Colour mainly black to deep brown with paler lateral median area; upper pygophore lobes hypertrophied into a pair of terminally rounded, paddle-like blinkers extending laterally from pygophore; claspers contain hooked processes on inner margins; beak acute. Aedeagus with dorsal curved, tapering, and acute pseudoparameres, which join endotheca near gonocoxite IX; endotheca curved and sclerotised.

FEMALE: Basic markings and colouration as in male. Dorsal surface of head shows a thin pallid fascia extending from median ocellus to fronto-clypeal suture. Central fascia of pronotum broader, extending to anterior pronotal margin. Tergite 9 dominantly (> 60%) black, becoming slightly paler laterally; silver-yellow dorsal pubescence. Sternites deep brown to black medially, the dark colouration extending outwards along the anterior margin of each sternite; remaining sternite colouration pale brown to yellow-brown; ovipositor sheath does not extend significantly beyond termination of tergite 9.

MEASUREMENTS: 75♂ and 41♀. Body length;

♂ 14.0-17.8 (15.94); ♀ 14.5-17.5 (15.95). Fore wing length: ♂ 16.0-20.3 (18.44); ♀ 17.8-21.3 (19.32). Head width: ♂ 4.5-5.5 (5.02); ♀ 5.0-5.6 (5.28). Pronotum width: ♂ 3.8-4.8 (4.23); ♀ 4.1-4.8 (4.46). Abdomen width: ♂ 4.1-5.2 (4.64); ♀ 4.1-4.7 (4.52).

COMMENTS

This species is similar to *P. fuscata* in morphology and distribution. The males are distinguished by the shapes of the pygophore upper lobes (terminally rounded, paddle-like blinkers in *P. corticinus*; hooked terminally in *P. fuscata*). Females differ in the intensity of the hind wing infuscation spots (strong in *P. corticinus*; weak in *P. fuscata*), the generally smaller body length of *P. fuscata*, and the more extensive black colouration on tergite 9 of *P. corticinus* (this being dominantly brown on *P. fuscata*).

DISTRIBUTION

This species extends from central eastern Queensland, near Mt Morgan, to south of Sydney, occurring coastally along New South Wales, and on the northern New England Tableland (Fig. 57). It is common throughout the southeastern corner of Queensland, including suburban Brisbane. In the northern part of its range, it occurs in higher country at Kroombit Tops, and is also common in the Carnarvon National Park, but not in the open dry lowland regions outside these tablelands. Specimens from northern Victoria need to be confirmed.

The habitat is open dry sclerophyll forest, in which it sings on the main trunks of dark coloured, and rough-barked trees (also dark fence posts) thereby being highly inconspicuous. It occurs from ground level to heights of about ten metres. The males tend to congregate locally, often along ridge crests. *P. corticinus* is found from September to April.

SONG

This is penetrating and readily identifiable in the field. It consists of short phrases (or perhaps more correctly referred to as compound phrase groups) most commonly four to ten in number, followed rapidly by a long phrase, the whole sequence being repeated (Fig. 17). The amplitudes of the short phrase groups, and the initial part of the long phrase, are of similar magnitude, there sometimes being a small amplitude decrease during the duration of the long phrase. The following notes refer to three specific calling song patterns.

The structures of the short phrases are similar, consisting of three (less commonly four) discrete

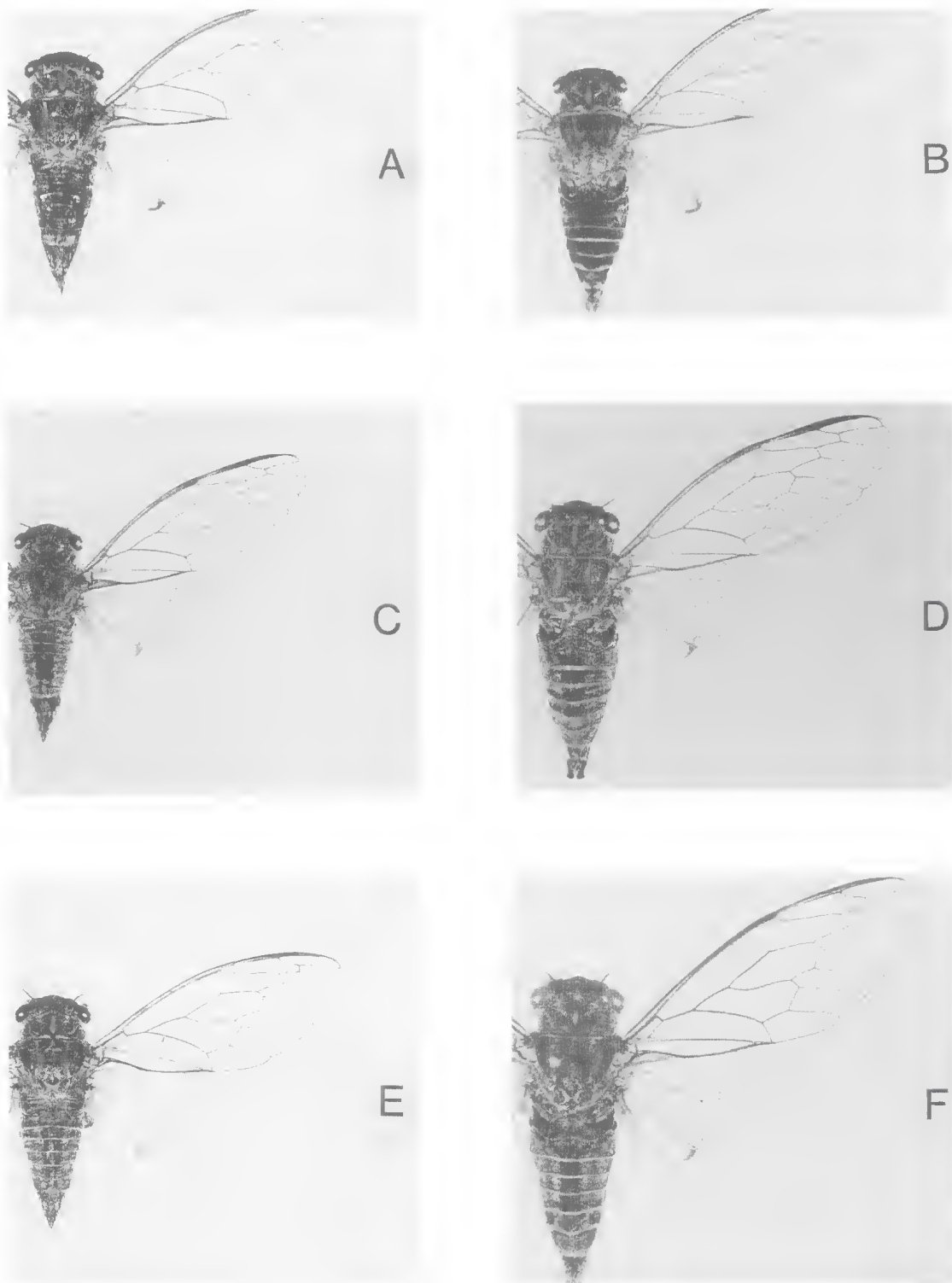


FIG. 18. A,B *P. corticinus* ♀, ♂. C,D *P. fuscata* ♀, ♂. E,F *P. collina* ♀, ♂. Photographs A,B,C and E $\times 2$ natural size; D and F $\times 2.7$ natural size. Photographs: D.M. Reeves

and separate pulse groups, followed by a longer composite pulse group; this latter in fact consists of three to four coalescing short pulse groups. The time intervals between the emission of the three short and following longer pulse groups progressively decrease, averaging approximately 25.5, 12.8 and 6 msec, respectively. In the example of the song recorded from the Carnarvon National Park, the final three or four pulse groups tend not to coalesce; thus, the short phrases in this case consist of 6 to 7 distinct pulse groups. The time intervals between each set of pulse groups for this song are 50-60 (first interval), 20-35, 15-20, 10-15, 2-15, 0-10 msec, respectively. Table 1 summarises comparative details of pulse group and phrase durations.

The overall song structure is developed from pulse groups with average durations of 16 msec, and which correspond to the short pulse groups forming the initial part of the short phrases. The longer phrases are formed by the coalescence of multiples of these pulse groups. On expanded time scales, each pulse group is seen to consist of nine

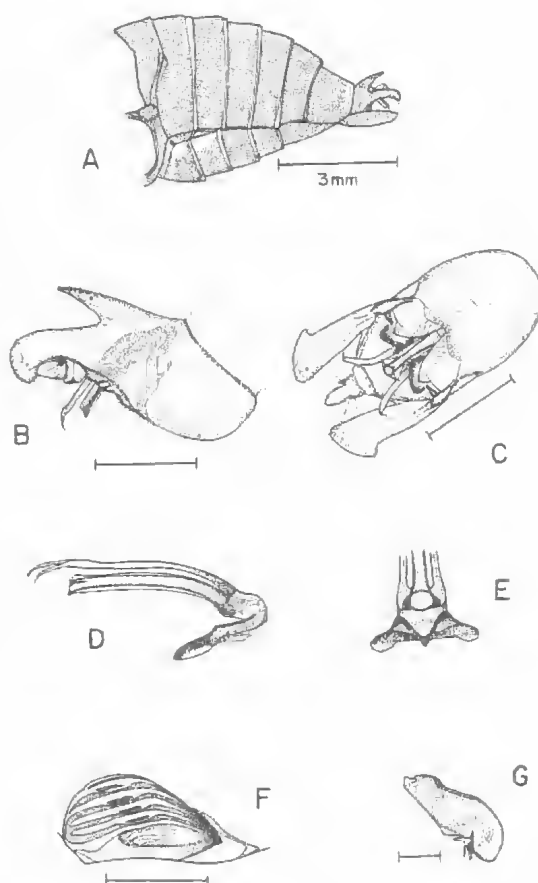


FIG. 19. *Pauropsalta fuscata* sp.n., ♂, based on specimen from Doolandella, southwestern Brisbane. Symbols A to G, and scales, as in Fig. 2.

distinct 'pulses', each of which is a complex pulse group whose structure cannot be further resolved with present data; these nine 'pulses' within each pulse group tend to cluster into triplets. The pulse repetition frequency is estimated to vary between 490-560 Hz.

***Pauropsalta fuscata* n.sp.**
(Figs 18,C,D,19-23,57)

Melampsalta (Pauropsalta) encaustica (Germar) Young, 1972:238,241, Pl. 1F.

Pauropsalta species B Ewart, 1986: 51-54, fig. 3B.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND, Doolandella, Brisbane, SEQ, 12.x.1981, A. Ewart (QM, Reg. No. T.9186).

TABLE 1. Comparative data on calling song patterns of *P. corticinus*.

	Beerburum (south Queensland)	Kroombit Tops (central Queensland)	Carnarvon National Park (central Queensland)
Short phrases			
1. Overall duration (sec)	0.13-0.16 (av. 0.14)	0.14-0.16 (av. 0.15)	0.19-0.25 (av. 0.20)
2. Duration of short pulse groups (msec)	13-18 (av. 16.1)	15-16 (av. 15.9)	10-13 (av. 11.3)
3. Duration of final (longer) pulse group (msec)	41-59 (av. 50.8)	56-60 (av. 57.7)	11-35 (variable)
Long phrases			
1. Overall duration (sec)	1.3-2.5 (av. 1.9)	0.84-1.2 (av. 1.0)	0.51-1.92 (av. 1.1)
2. Duration between long phrases (sec)	3.2-6.0	1.7-3.7	2.7-3.3

PARATYPES: QUEENSLAND: 1♂, Doolandella, Brisbane, 11.x.1981, A.E.; 1♀, 8.ii.1982 (ANIC). 1♂, 1♀, Doolandella, Brisbane, 11.xii.1981, to light, A.E. (BMNH). 1♂, Doolandella, Brisbane, 11.x.1981, A.E. (MNDN). 1♂, NH, no date, coll. unknown (HEC). 2♂♂, 1♀, Brisbane, 28.ii.1954, J. Kerr; 1♂, 16.ix.1955, 1♀, 11.i.1957, 1♀, 15.i.1957; 1♀, Burleigh, 6.x.1966, AB; 1♂, Imbil, 26.x.1980, A. Nebois; 1♀, Mt Glorious, 3.i.1960, JK; 3♂♂, Palmwoods, 25.ix.1955, AB, 1♂, 3.x.1955, AB (MV). 1♂, Brisbane, 4.ii.1914, H. Hacker (QM). 2♂♂, 1♀, Blackdown Tableland, Expedition Range, 5-6.xii.1979, M.A. Schneider, G. Daniels; 2♀♀, Carnarvon Gorge, 7.xii.1979, mv lamp, G. Daniels, M.A. Schneider (UQIC). 1♂, nr Bouyal on Childers to Gin Gin sect. of Bruce Hwy, Loc. 26, 1.ii.1973, J. Moss; 1♂, Booyal, nr Childers, 11.ii.1973, J.T. Moss; 1♂, 1♀, Caloundra, 3.ii.1980, J.T. Moss; 1♀, Doolandella, Brisbane, 27.ix.1982, J. Moss, A.E.; 1♂, Eldsvold, 25.xii.1984, J.T. Moss; 1♀, Pike's Ck, 11 mi. W of Pikedale, 4.xii.1966, T.G. Campbell; 2♂♂, Rainbow Bch, via Gympie (wallum), 28.i.1973, J.T. Moss; 1♂, Round Hill Hd, nr Town of 1770, 26.x.1973, J.T. Moss; 6♂♂, 1♀, Tin Can Bay (wallum), 11.xi.81, J.T. Moss; 1♂, Tin Can Bay, 18.x.1983, J.T. Moss; 1♂, Woolooga nr Gympie, 20.ii.1973, J.T. Moss (JM); 1♂, Beerburum, 29.ix.1979, J. North; 1♂, Blackdown Tableland, Expedition Range, 10.xi.1973, A. Atkins; 1♀, 3.xi.1974, 2♂♂, 1♀, 9.xi.1974, G. Daniels; 1♀, 9.i.1976, 3♀♀, 8♀♀, 1-6.ii.1981, G.B. Monteith; 1♂, Carnarvon Gorge, 5.ix.1971, M.S. Moulds; 1♂, Doolandella, Brisbane, 17.xii.1981, A. Ewart; 1♀, 17.ii.1982; 1♀, Kinbombi Falls nr Goomeri, 19.xii.1976, M.S. and B.J. Moulds; 1♀, Maryborough, Rifle Range, 21.xi.1986, R. Eastwood; 1♀, Maryborough, Pistol Club, 22.xi.1986, R. Eastwood; 2♂♂, 20 km N of Monto, 6.xii.1979, M.S. and B.J. Moulds; 1♂, Mt Nebo, 500 m, nr Brisbane, 15.xii.1984, A. Hiller; 1♂, Mullen S.F. nr Tin Can Bay, 4.ix.1980, G. Daniels; 1♂, Porcupine Gorge, NNE of Hughenden, 11.ix.1983, A. Walford-Huggins; 1♂, Stockyard Ck, SE of Capalaba, 23.ix.1981, G. Daniels; 1♂, Wild Horse Mt, 21.xi.1985, R. Eastwood (MSM). 14♂♂, 3♀♀, Blackdown Tableland, Spring Ck camping area, 15-16.xii.1985, J.T. Moss, A.E.; 5♀♀, 1♀, Boolimba Bluff, Carnarvon N.P., 1.xi.1976, A.E.; 1♂, Burnett Ck, Mt Maroon, 16.xi.1975, A.E.; 2♂♂, Coolool, Wallum Research Stn, 17.x.1981, A.E.; 1♂, Doolandella, Brisbane, 27.ix.1981, A.E.; 3♂♂, 3♀♀, 11.x.1981, 4♀♀, 12.x.1981, 2♀♀, 11.xii.1981, 2♀♀, 1♀, 12.xii.1981, 1♀, 2.i.1982, 2♂♂, 22.i.1982, 1♀, 9.ii.1982, 3♀♀, 17.ii.1982, 2♂♂, 27.ix.1982, 3♂♂, 9.x.1983, 1♀, 14.x.1983, 1♂, 9.xi.1983; 1♀, Leyburn, 27.x.1979, D. Binns (AE). NEW SOUTH WALES: 1♂, Nelson Bay, 12.xi.1960, I.F.B. Common and M.S. Upton (ANIC). 1♂, Camden, 8.i.1948, A.B. and R.T.M.P.; 2♀♀, Coffs Harbour, xii.1948, F.D.; 2♀♀, Toronto, 24.ix.1931, AB (MV). 2♂♂, Elizabeth Bch, 16 km S Forster, 10.xi.1969, J.T. Moss; 2♂♂, Forestry Rd E of Stroud nr Bulahdelah, 7.xii.1967, J.T. Moss; 7♀♀, Kempsey, 11.xi.1984, J.T. Moss; 1♀, Laurieton, N Taree, 19.xii.1967, J.T. Moss; 1♀, 2♀♀, Macksville, 10.xi.1969, J.T. Moss; 4♂♂, South West Rocks nr Kempsey, 28.ix.1980, J.T. Moss (JM). 1♂, 14 mi. S from Bonshaw on Glen Innes Rd,

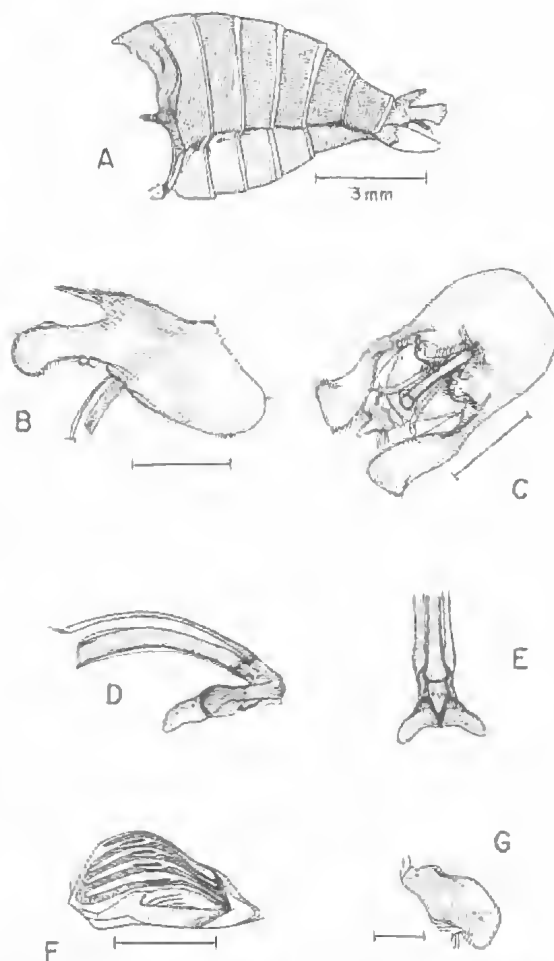


FIG. 20. *Pauropsalta fuscata* sp.n., ♂, from specimen from road between Wauchope-Port Macquarie, New South Wales. This is same specimen recorded by Young (1972) and listed under the species *P. encaustica*. Symbols A to G, and scales, as in Fig. 2.

11.xi.1973, M.S. Moulds; 1♂, c. 10 km NW Bonny Hills, dry scler. forest, 17.xii.1981, G. and T. Williams; 1♂, Bumbery, 30.xii.1976, prey of *Neoratus hercules*, G. Daniels; 1♂, Charmhaven, nr Gosford, 5.i.1972, M.S. Moulds; 1♂, S end Newell Hwy, NE Coonabarabran, 23.xi.1985, G. Williams, ex dry scler. forest; 5♀♀, Failand, nr Taree, 7.i.1972, M.S. Moulds, 2♂♂, 8.i.1972; 4♂♂, Forster, 27.ix.1979, J. Olive; 1♂, 4 km N Garrawilla, 22.xi.1985, G. Williams, ex dry scler. forest; 1♂, Kew, nr Pt Macquarie, 10.i.1972, M.S. Moulds; 1♂, 1-2 km N of Kew, in dry scler. forest, 21.xi.1982, G. and T. Williams; 5♂♂, 1♀, L. Munmora, nr Doyalson, 1.xi.1987, M.S. and B.J. Moulds; 1♂, Trig. Rd, Lansdowne S.F., on casuarina trunks in dry scler. forest, 9.x.1981, G. and T. Williams, on young eucalypt; 1♂, NW sect. Lansdowne S.F., N of Taree, 17.xi.1983, dry scler. forest, G. Williams; 1♂, 4-5 km N of

Laurieton, 6.xi.1983, in dry scler. woodland, G. Williams; 3♂♂, Maria R. S.F., Kempsey, 15.xi.1974, G. Daniels; 1♂, Milperra, 18.xii.1966, G.R. Brown; 1♂, Mitchell's Island S.F., E Taree, in dry scler. forest, 6.xi.1981, G. and T. Williams; 1♂, N Brother Lookout, Camden Haven S.F., 6.xi.1980, on casuarina sp., G. and T. Williams; 1♂; 1♀, c. 2 km SW of Old Bar, in dry scler. forest on the trunks, 9.xi.1982, G. and T. Williams; 1♂, 5 km E Rocky Glen, in dry scler. forest, 24.xi.1981, G. and T. Williams; 6♂♂; 1♀, Smith L. nr Seal Rocks, Gahnia Swamp, 4.ix.1972, J.V. Peters; 1♂, 5.ix.1972; 1♂, S sect. Styx River S.F., NW of Kempsey, dry scler. forest, G. Williams and S. Watkins; 1♂, Upper Colo Colo R., 16.xii.1970, J.V. Peters; 2♂♂, Upper Eden Ck, Kyogle, 14.xi.1965, M.S. Moulds; 2♂♂, Yarratt S.F., NE Wingham, in dry scler. forest, 17.xii.1982, G. and T. Williams; 1♂, central W sect. Yarratt S.F. NE Wingham, dry scler. forest, 7.i.1984, G. Williams, C. Cross, 1♂, 3.ii.1984, G. Williams (MSM). 1♂, 4.5 km WSW of Drake via Tenterfield, 4.ii.1979, D. Binns; 2♂♂, 12.5 km WSW of Urbenville, 20.i.1979, D. Binns;

2♂♂, Wauchope-Pt Macquarie road, D. Young (song recorded and published in Young 1972); 1♀, 18 km NW of Woodenbong, 22.i.1979, D. Binns (AE).

ETYMOLOGY

Derived from the Latin *fuscus*, meaning dark or dusky.

DESCRIPTION

MALE: Head: Postclypeus black anteriorly with well defined pinkish-brown margin and a pinkish-brown spot dorsally on midline; dorsal surface black with short golden pubescence; golden pubescence in grooves between transverse ridges. Anteclypeus black, shiny, with conspicuous silver pubescence. Rostrum brown, becoming black apically; extends to mid coxae; silver pubescence present. Gena and mandibular plate black, with intervening pale brown suture; conspicuous silver-gold pubescence. Antennae black. Ocelli pink. Eyes medium brown. Dorsal surface of head black with pronounced pale brown triangular shaped and depressed suture between ocelli, apex pointing anteriorly, and extending from posterior edge of plate; short yellow-brown pubescence, becoming silvery and more conspicuous behind eyes. Vertex lobes brown.

Thorax: Pronotum black with pale brown central fascia not extending to pronotal collar, with wedge-shaped terminations; short golden pubescence; pronotal collar reddish-brown.

Mesonotum mostly black; a pair of dorsolateral brown fasciae, broadened and inward curving medially; cruciform elevation pale reddish-brown along ridges, black between ridges; short silver-gold pubescence present, becoming more conspicuous around cruciform elevation and along pale brown wing grooves and adjacent ridges.

Legs: Coxae predominantly black with reddish-brown longitudinal fasciae; mid and hind femora deep-brown to black with pale fasciae on inner margins; fore and mid tibiae and tarsi predominantly deep brown to black; hind tarsi pale brown; spines and claws deep brown to black.

Wings: Fore wing venation brown to reddish-brown, becoming darker distally; fore wing costal veins dark brown; pterostigma deep brown to black; infuscation spots on hind wings generally faintly developed.

Tymbals: The three lower ridges joined anteriorly; dorsal ridge extends across dorsal inter-ridge sclerite; distinct basal spur.

Opercula: Roughly sickle or kidney-shaped, obliquely elongated; declivous flange along outer and posterior margins; central region somewhat

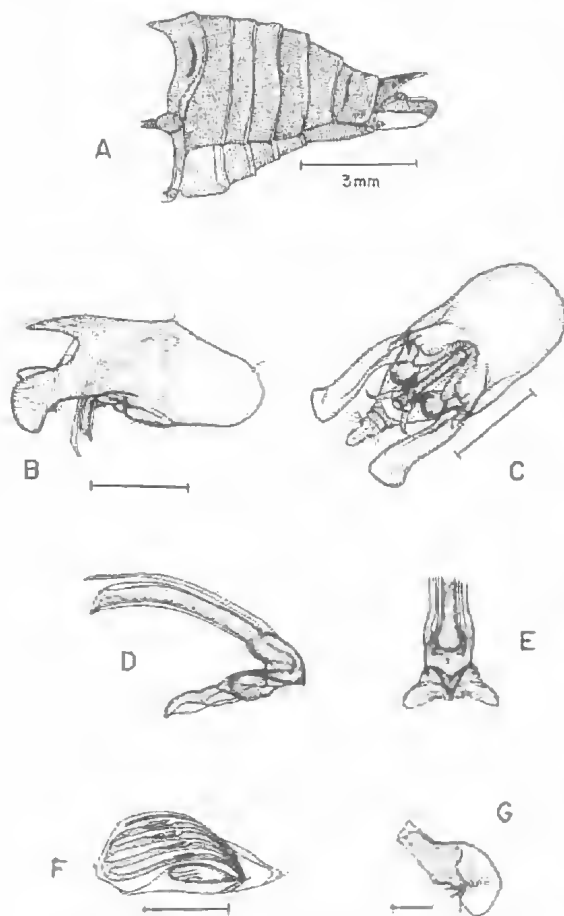


FIG. 21. *Pauropsalta fuscata* sp.n., ♂, based on specimen from Macksville, New South Wales (JM collection). Symbols A to G, and scales as in Fig. 2.

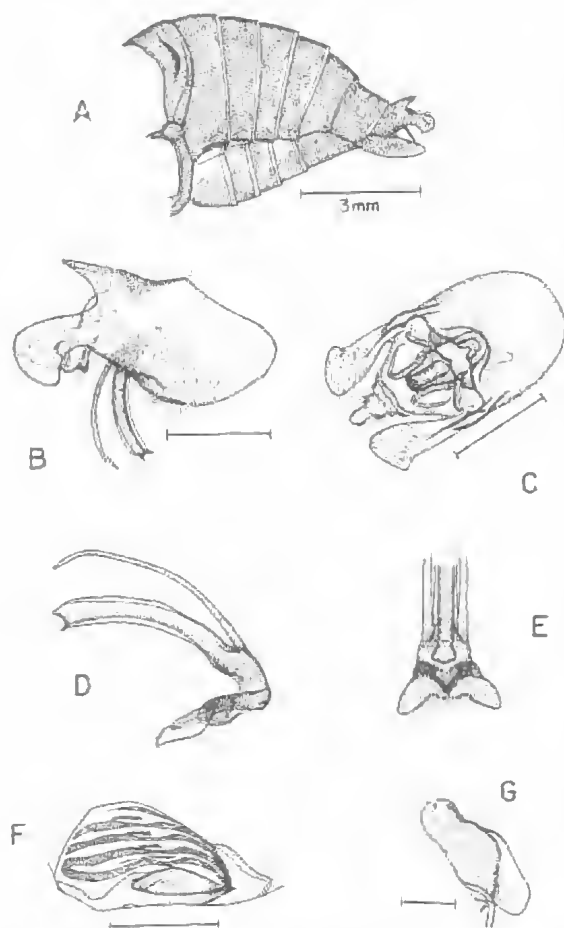


FIG. 22. *Pauropsalta fuscata* sp.n., ♂, from Carnarvon National Park, central southern Queensland. Symbols A to G, and scales as in Fig. 2.

domed, grading into the undulate posterior area; colour black with pale brown zone around posterior margin; prominent silver pubescence.

Abdomen: Tergites black with pale green-grey to pale brown posterior margins between tergites 3 to 8; tergites 4 to 8 exhibit a thin reddish-brown zone adjacent to the posterior margins, most conspicuous dorsolaterally. Sternites mainly black with minor lateral brown colouration on sternites III, decreasing in amount through to V; sternite VIII dark brown, becoming paler distally. Short silver-gold pubescence developed laterally.

Genitalia: Pygophore dominantly black; upper lobes hypertrophied into a pair of blinker-like structures which are rounded and strongly hooked terminally; beak well defined, tapering. Aedeagus with dorsal pseudoparameres longer than

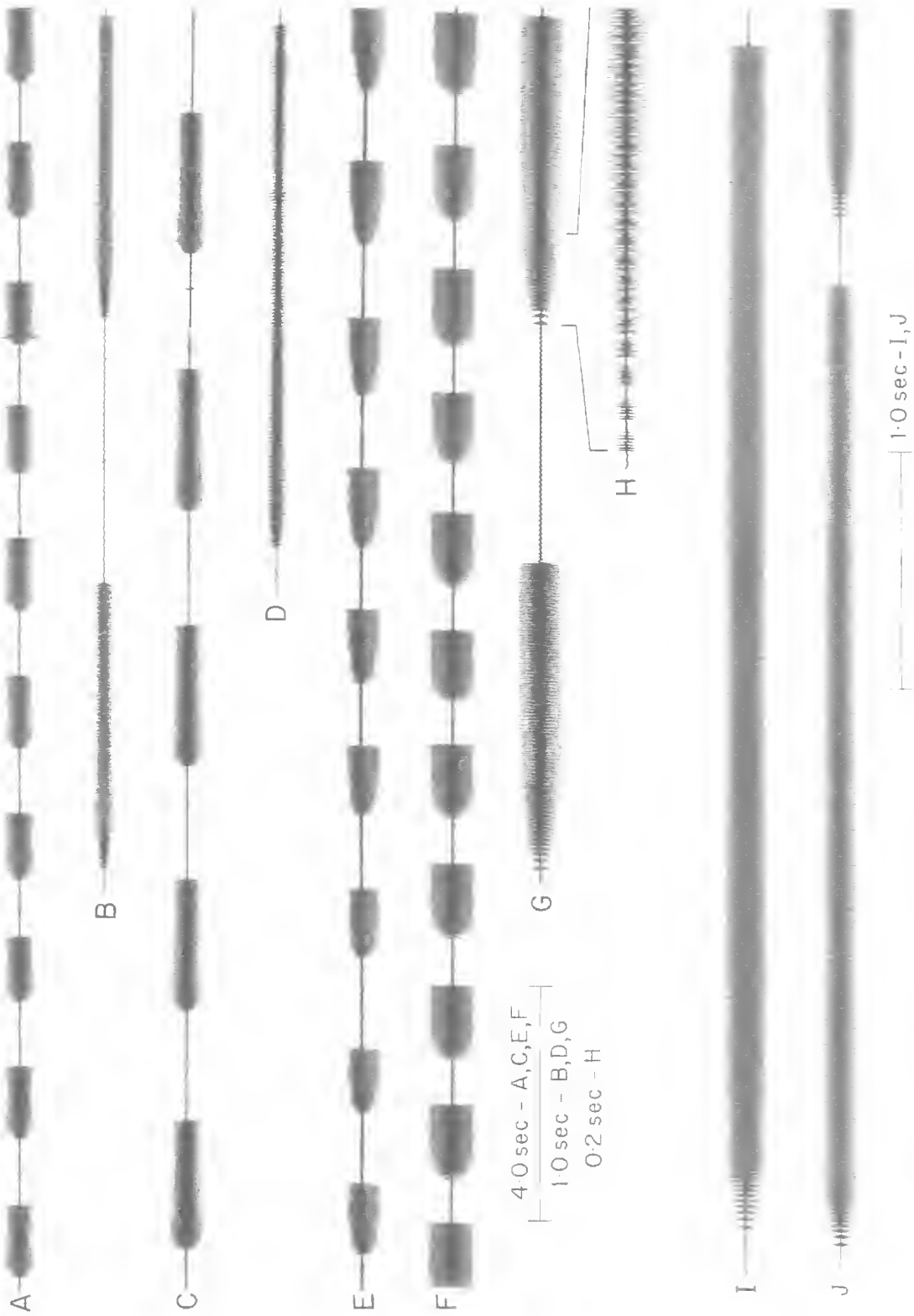
endotheca, apices tapering and curved; bifurcation of pseudoparameres occurs near to join with endotheca; endotheca characterised by a pair of lateral wing-like processes which taper towards base.

FEMALE: Head, thorax, legs, and wings similar to male. Tergites similar to male, except that the reddish-brown zones adjacent to posterior margins, occurring dorsolaterally to laterally on tergites 3 to 8, are more prominent and clearly defined; tergite 9 dark brown becoming paler posteriorly, with black dorsolateral black fasciae. Sternites III to VII deep brown to black medially, each dark area narrowing posteriorly; remaining colouration brown to reddish-brown; ovipositor sheath not extending significantly beyond termination of tergite 9.

LOCAL VARIANTS: At three localities towards the northern and northwestern limits of the known range of *P. fuscata* — Porcupine Gorge, near Hughenden, Blackdown Tableland and the Carnarvon Gorge — some morphological and song differences have been noted, and the species in these areas are believed to be represented by isolated populations. Specimens from the Carnarvon area are the most divergent, most notably with respect to male pygophore, tymbal, and opercula structures (Fig. 22). For example, the upper pygophore lobes are larger, while the spur-like process extending from the lower lobes are greatly reduced. The endotheca is characterised by larger terminal wing-like lateral processes, and is ornamented.

MEASUREMENTS: 43♂♂ and 10♀♀ from S Queensland; 12♂♂ and 2♀♀ from New South Wales. S QUEENSLAND: Body length: ♂ 11.7–16.8 (14.08); ♀ 13.2–15.0 (14.00). Fore wing length: ♂ 12.7–17.0 (15.69); ♀ 15.2–17.8 (16.48). Head width: ♂ 4.0–4.9 (4.46); ♀ 4.3–4.9 (4.60). Pronotum width:

FIG. 23. Oscillograms of six sets of calling songs of *P. fuscata*. These are from: A, B and C, D, two sets of songs from Doolandella, southwestern Brisbane (Sep. 1981, Oct. 1981); E, Elizabeth Beach, Foster, New South Wales (JM); F to H, road between Wauchope and Port Macquarie (this being the recording published by Young 1972, under the name *P. encaustica*; see also Fig. 20); I, Boolimba Bluff, Carnarvon National Park (central southern Queensland, Dec. 1985); J, Blackdown Tableland (central eastern Queensland, Dec. 1985). Three time scales are shown for the various recordings, as indicated by the scales; for example, records A, C, E, and F can be directly compared, as can records B, D, G, I, and J.



± 3.0-4.2 (3.74); ± 3.6-4.1 (3.85). Abdomen width: ♂ 3.5-4.6 (4.09); ♀ 3.6-4.1 (3.88). NEW SOUTH WALES: Body length: ♂ 13.7-17.0 (14.92); ♀ 14.0-14.2. Fore wing length: ♂ 15.7-18.3 (16.95); ♀ 16.3-16.8. Head width: ♂ 4.3-5.1 (4.69); ♀ 4.6. Pronotum width: ♂ 3.6-4.5 (3.92); ♀ 3.9-4.0. Abdomen width: ♂ 4.0-4.8 (4.33); ♀ 3.8-3.9.

COMMENTS

This species resembles *P. corticinus* and is distinguished as given in the description of *P. corticinus*. It is closest, however, to *P. collina* and, initially, the field recognition of these two species was made by male calling songs. Males are distinguishable on the basis of dorsal tymbal ridges (short, and not extending across dorsal inter-ridge sclerite in *P. collina*; longer, and extending beyond inter-ridge sclerite in *P. fuscata*) and colour of pygophore upper lobes (pale brown in *P. collina*; black in *P. fuscata*). Females, however, are usually very difficult to distinguish. Subtle differences in colouration are usually apparent, most notably the reddish-brown areas around the cruciform elevation and along the posterior edges of the tergites in *P. fuscata*; in *P. collina*, these areas are pale brown to pale pink. These differences are not necessarily diagnostic in all specimens.

DISTRIBUTION

Mainly coastal New South Wales, northwards from near Sydney, to coastal southeastern Queensland (Fig. 57). This species also occurs further inland, notably on the Blackdown and Carnarvon tablelands in Queensland, and the Coonabarabran area, New South Wales, which are all relatively elevated areas. There is a single record from Porcupine Gorge, near Hughenden.

Habitat preference is for open dry sclerophyll forest, extending to heathland and wallum on the coast. Although a much more subdued, and less conspicuous cicada than *P. corticinus*, both species completely overlap in habitats in southeastern Queensland. It typically rests and sings on tree trunks, posts, and shrubs. In southern Queensland, this species occurs between September to April and is uncommon in the later part of the season.

SONG

Within the main area of its range, the calling song consists of a regularly repeated phrase; initially, the amplitude increases rapidly, thereafter remaining constant (Fig. 23). The initial part of the phrase starts with a series of distinct composite pulse groupings, particularly well

defined in the song from the Wauchope specimen (Fig. 23G,H); the phrases finish abruptly. The expanded time scale (Fig. 23H) shows the phrases to comprise compound pulse groups, triply grouped, with a repetition frequency close to 400 Hz.

Young (1972) described this song under *P. encastica*, and the oscillograms illustrated in Fig. 23F-H are reproduced from his original tape, recorded between Wauchope and Port Macquarie. Although the song patterns shown in Fig. 23 have the same basic structures, and are taken as the most diagnostic criterion in grouping these cicadas into a single species, phrase and inter-phrase lengths are variable. For the four recorded songs (shown in part on the oscillograms in Fig. 23A-H), the phrase lengths are, respectively (A through to H), 1.0-1.4; 2.2-2.4; 1.1-1.4; and 1.2-1.3 secs. The corresponding inter-phrase intervals are 0.95-1.1; 1.88-1.94; 1.0-1.6; and 0.72-1.0 sec.

Aural observations on *P. fuscata* from the Carnarvon and Blackdown Tableland areas indicate that the phrases are significantly longer than for the other, more southerly populations, and this is confirmed by recordings; examples of phrases from these two localities are shown in Fig. 23I,J. The following phrase lengths are measured for these populations: 4.6-5.0 and 3.3-4.1 secs, respectively; corresponding inter-phrase intervals are 0.26-0.27 and 0.29-0.35 sec, respectively.

Pauropsalta collina n.sp. (Figs 18E,F, 24, 25, 57)

Pauropsalta species C Ewart, 1988:181, figs 1, 9B,C, Pl. 1B.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND: Girraween National Park, 26.xi.1980, A. Ewart (QM, Reg. No. T.9187).

PARATYPES: QUEENSLAND: 1♂, 1♀, Girraween N.P., 26.xi.1980, A.E. (ANIC). 1♂, 1♀, Duntroon area, L. Broadwater, 30 km SW Dalby, 22.ii.1987, A.E. (BMNH). 1♂, 1♀, Duntroon area, L. Broadwater, 30 km SW Dalby, 22.ii.1987, A.E. (MNDN). 1♂, Glen Aplin, 28.x.1945, AG. (MV). 1♀, Girraween N.P., 26.xi.1980, A.E.; 1♀, Wyberba, 5-7.xi.1969, E.C. Dahms (QM). 1♂, Mr Norman, Wallangarra, 7-8.x.1972, B. Cantrell (UQIC). 2♂♂, Girraween N.P., nr Stanthorpe, 11.ix.1982, J.T. Moss; 1♂, 24.xii.1983; 1♂, Goomburra For. Res. nr Allora via Warwick, 21.xi.1984, J.T. Moss; 1♂, 'Kragra', Chinchilla, Euc. maculata, Bulloak, and Acacia sp. ?crassa, ridge, 29.i.1986, Grace Lithgow; 7♂♂, Leslie Dam, via Warwick, 18.xi.1984, J.T. Moss (JM). 1♂, Dalveen, N of Stanthorpe, 19.xii.1951, V. Fanning; 1♂, Fletcher, nr Stanthorpe, 24.x.1963, M.S. Moulds; 2♂♂, L. Broadwater nr Dalby, site B, 27°21'S 151°06'E, 28.ix.1986, G. and A. Daniels; 2♂♂, 6 km N

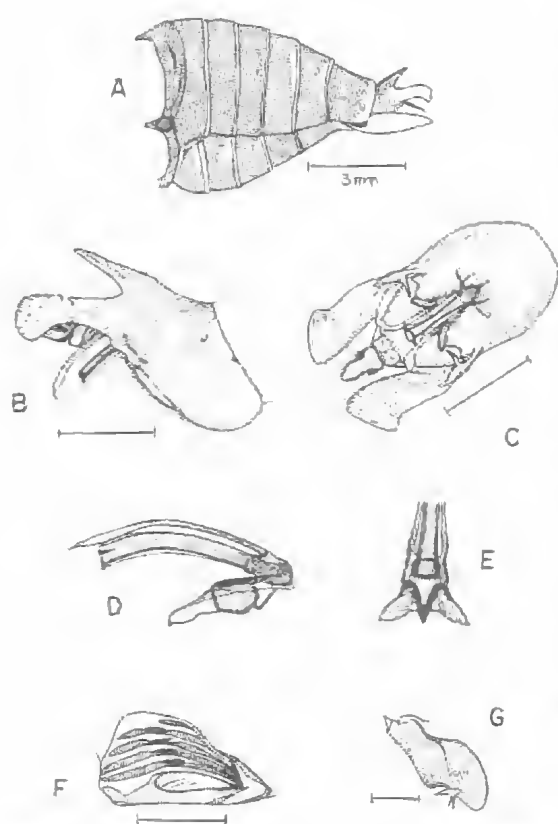


FIG. 24. *Pauropsalta collina* sp.n., ♂, from Girraween National Park, southern Queensland. Symbols A to G, and scales, as in Fig. 2.

Leyburn, 27°58'S 151°38'E, 22.x.1985, G. Daniels (MSM). 1♂, Camp Mt via Samford, 2.xii.1978, A.E.; 19♂♂, 25♀♀, Duntroon area, L. Broadwater, 30 km SW Dalby, 22.ii.1987, A.E.; 1♂, 1♀, Girraween N.P., 26.xi.1980, A.E.; 1♂, Tom Plants lagoon, Stanthorpe, i.1981, D. Reeves (AE). NEW SOUTH WALES: 1♂, Bald Rock N.P., 30.xi.1981, M.A. Schneider and G. Daniels (UQIC). 2♂♂, 1♀, 5 km N Bolivia Hill, 30 km S Tenterfield, 3.i.1988, J.T. Moss (JM). 2♂♂, Dundee nr Glen Innes, 6.xii.1962, M.S. Moulds, 2♂♂, 9.xii.1962, 6♂♂, 12.xii.1962, 1♂, 12.xi.1963, 1♂, 13.xi.1963, 1♂, 19.xi.1963, 1♂, 20.xi.1963, 1♂, 6.xii.1963, 1♂, 12.xi.1983; 1♂, Glen Innes, 20.xi.1966, M.S. Moulds; 10♂♂, 4♀♀, Main Camp Ck, c. 27 km E Deep Water, 13.xi.1973, M.S. Moulds (MSM). 2♂♂, Billyrimba Lookout via Tenterfield, c. 1100 m, 13.i.1979, D. Binns (AE).

ETYMOLOGY

Derived from Latin *collina*, high ground or hill.

DESCRIPTION

MALE: Head: Postclypeus shiny black anteriorly with sharply defined, narrow pale pink-brown

margin, extending slightly into grooves between transverse ridges; small median brown spot dorsally on midline; silver-yellow pubescence; dorsal surface black with short yellow-gold pubescence. Anteclypeus shiny black with conspicuous silver pubescence. Rostrum pale brown grading to black apically, extends to mid coxae. Gena and mandibular plate black with intervening pale brown suture; conspicuous silver pubescence. Dorsal surface of head black with short yellow pubescence, and pallid depressed longitudinal suture between ocelli. Ocelli deep red. Eyes medium brown. Vertex lobes pale reddish-brown.

Thorax: Pronotum black with pale brown, spindle-shaped, short central fascia; short yellowish pubescence, especially concentrated adjacent to oblique fissures; anterior margin pale brown dorsolaterally; pronotal collar black with narrow reddish-brown margin.

Mesonotum mostly black; dorsal region of cruciform elevation predominantly pale pink to pale brown, except for a narrow black longitudinal fascia; short, narrow, pale reddish-brown dorsolateral fasciae extend from anterior arms of cruciform elevation; wing grooves and ridges pale brown to pale reddish-brown.

Legs: Coxae black with red-brown longitudinal fasciae along margins; fore femora with alternate black and pale red-brown fasciae; mid and hind femora black to deep brown, pallid distally; fore tibiae black; mid tibiae deep brown to pallid; hind tibiae pallid; fore tarsi black, becoming paler towards hind tarsi; claws and spines deep brown to black.

Wings: Fore wing venation reddish-brown becoming darker distally around apical cells and ambient veins, with dark costal veins; pterostigma black; infuscation along vein 1A + 2A of fore wing very faint; infuscation spot at anal margins of hind wings dark brown.

Tymbals: Dorsal ridge does not extend across dorsal inter-ridge sclerite; lower ridges not obviously joined anteriorly; distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated, broadly rounded along inner terminations; longitudinally undulate (i.e. parallel to body axis); colour black, grading to dark-brown along posterior marginal region; declivous flange developed especially along outer margin; surface somewhat shiny on anterior half of opercula, becoming finely rugose posteriorly; silver pubescence.

Abdomen: Tergites black with distinct pale yellow-brown posterior margins; tergites 3 to 7

with narrow reddish-brown to orange-brown dorsolateral to lateral zones adjacent to posterior margins of each tergite, becoming broader and more conspicuous towards tergite 7; tergite 8 with distinct pale brown zone extending around the whole posterior margin; sparse, short silver pubescence. Sternites predominantly black to deep brown, slightly paler dorsolaterally on sternites III and IV, and pale brown on posterior area of sternite VII; posterior margins of sternites pale yellow-brown; sternite VIII mostly pale to medium brown.

Genitalia: Colour black grading to pale brown on upper lobes; upper lobes hypertrophied into a pair of blinker-like structures with acutely angulated terminations; lower lobes distinct; inner lobes somewhat rounded apically; claspers pointed apically; aedeagus with a pair of dorsal pseudoparameres, apically acute and tapering, each with a distal hair-like process; pseudoparameres join endotheca near to gonocoxite IX; endotheca sclerotised with a pair of terminal lateral wing-like processes.

FEMALE: General colouration and markings similar to male, but with decreased proportion of black colouration. Pronotum with a more conspicuous pale yellow-brown to greenish-brown central fascia and brown pronotal collar, becoming reddish-brown along margin. Mesonotum black with conspicuous pale greenish-brown dorsolateral fasciae extending to anterior arms of cruciform elevation; cruciform elevation pale brown to reddish-brown; wing grooves and ridges reddish-brown. Wings and legs as in male. Abdomen: Tergites black with narrow pale brown dorsolateral to lateral zones along posterior edges of tergites 3 to 8, becoming broader and more conspicuous towards tergite 8; tergite 9 mainly pale brown with black fascia. Sternites pale brown to sandy-brown with broad median black fascia; ovipositor sheath not extending significantly beyond termination of tergite 9.

MEASUREMENTS: 20♂♂ and 14♀♀. Body length: ♂ 13.7-15.7 (14.90); ♀ 13.5-16.3 (14.55). Fore wing length: ♂ 15.7-18.3 (17.04); ♀ 16.3-18.3 (17.05). Head width: ♂ 4.6-5.1 (4.82); ♀ 4.6-5.2 (5.03). Pronotum width: ♂ 3.8-4.3 (4.01); ♀ 3.9-4.5 (4.26). Abdomen width: ♂ 3.9-4.6 (4.26); ♀ 3.8-4.5 (4.15).

COMMENTS

This species is most similar to *P. fuscata* and differences are noted in the discussion of that species. *P. collina* is also very similar to *P. encaustica*, although their distributions do not overlap. Females of these two species are very

similar, but males are distinguished by colour of pygophore upper lobes (tending to pallid in *P. encaustica*; brown in *P. collina*), and relative lengths of dorsal tymbal ridge (short, not extending beyond dorsal inter-ridge sclerite in *P. collina*; longer, extending beyond dorsal inter-ridge sclerite in *P. encaustica*). Songs are very distinctive.

P. collina is also superficially similar to *P. siccanus*, but is easily distinguished by tymbal ridge structures (compare Figs 24F, 26F); the presence of two very distinct hind wing infuscation spots in *P. siccanus*; and sternite colouration (paler with clearly defined median black fascia in *P. siccanus*, although this colour difference is not as clearly defined in female specimens).

DISTRIBUTION

The species occurs extensively in the high country of the granite belt of northeastern New South Wales and southeastern Queensland, north from Glen Innes (New South Wales), through the Stanthorpe region to Warwick (Leslie Dam), the Main Range mountains east of Allora, and westwards to near Dalby and Chinchilla (Fig. 57). A single record exists from the lower D'Aguilar Range, north of Brisbane. The overall distribution is thus confined to the higher areas of southeastern Queensland and northern New South Wales and mainly associated with granitic and sandy soils. Habitat is open dry sclerophyll forest.

This species is active between September to March.

SONG

This is unique amongst the southern Queensland cicadas so far studied, but regional variation is found amongst southerly populations.

Girraween and Lake Broadwater songs (Fig. 25A-E): These consist of regularly repeated phrases, each phrase of between 0.45-0.62 (av. 0.58) sec duration, with an interphrase interval varying between 0.26-0.4 (av. 0.38) sec. Each phrase starts abruptly with a constant high amplitude portion, lasting between 0.22-0.29 sec, which is then rapidly damped to a low amplitude phase; this latter progressively decreases, and then increases in amplitude before abruptly ceasing. To the ear, the song has a peculiar 'twang' sound. Examination on an extended time scale (Fig. 25B) suggest that the initial high amplitude portion of each phrase has two superimposed phases, a high and a low amplitude phase, the latter continuing through the complete phrase. This low amplitude phase comprises separate pulse groups, each of

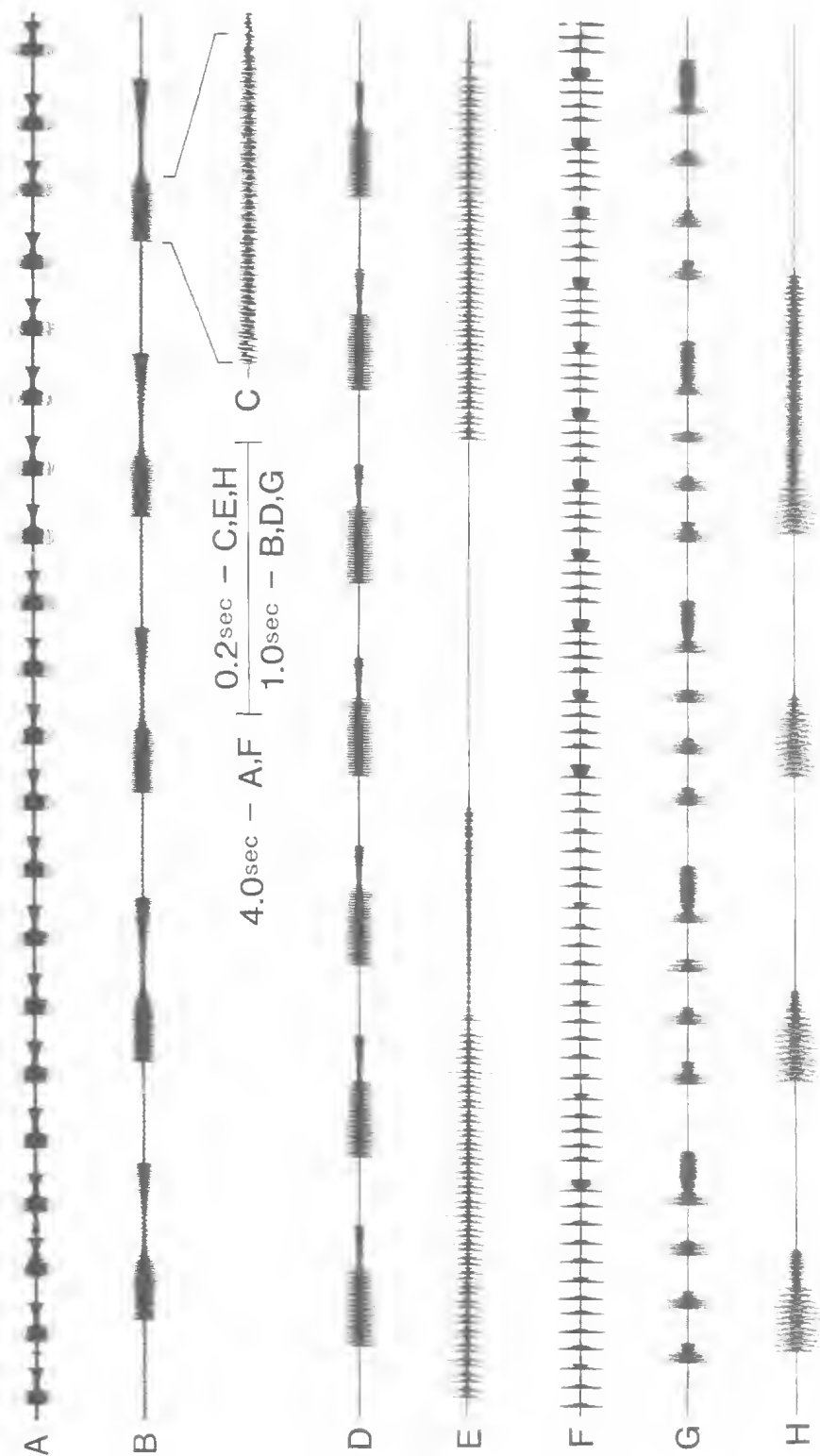


FIG. 25. Oscillograms of three sets of calling songs of *P. collina*. A to C, Girraween National Park (Nov. 1980; shown at three time scales). D and E, Lake Broadwater (30 km SW Dalby, southeastern Queensland; February 1987). F to H, 5 km N of Bolivia Hill (30 km south of Tenterfield, northeastern New South Wales; January, 1988; shown at three time scales).

approximately 2 to 3 msec duration, separated by intervals of approximately 1.5 to 3 msec which markedly decrease in the final increasing amplitude portion of the phrase. The high amplitude phase consists of discrete and sharply defined pulse groups, which occur in pairs; intervals between pairs are approximately 5 msec, while between the paired pulse groups are approximately 3.8 msec. The overall repetition rate of the high amplitude phase is 225-230 Hz. Each pulse group consists of four almost superimposed pulses.

Bolivia Hill song (30 km S of Tenterfield, New South Wales; Fig. 25F-H): This is a more variable song, although still comprising regularly repeated phrases each with an initial high amplitude portion, followed abruptly by a damped, low amplitude portion which usually (but not always) increases slightly in amplitude before abruptly ceasing. The individual phrase lengths are shorter than observed in the previously described songs, varying from 80-220 msec duration. The initial high amplitude portions, however, are of less variable length (between 40-50 msec). It is the low amplitude portions of each phrase that are clearly most variable. It is seen from Fig. 25F,G that certain portions of the song show systematic changes of phrase structure, the sequence repeated every four phrases. Phrase lengths progressively decrease in the first three phrases of each sequence followed by a long final phrase, as follows: 70-80 msec (first phrase); 60-70 msec; 40-60 msec; 190-220 msec (final phrase of sequence). Interphrase intervals vary from 110-140 msec within each phrase sequence, but between each sequence of four phrases, range between 210-240 msec. Only the final phrase of each sequence produces the distinctive 'twang' as heard aurally. The expanded time scale oscillogram (Fig. 25H) shows that the structures of the low amplitude portions of each phrase are similar to the songs described previously. The pulse structure of the higher amplitude portions are not arranged as pairs of pulses, the individual pulses being more complex, each of approximately 4 msec length, with a similar interval between pulses.

***Paupsalta siccanus* n.sp.**
(Figs 26,27,52C,D,57)

Paupsalta species F Ewart, 1988:182, figs 4,11G,H, Pl. 4G.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND: Injune-Rolleston Rd, 15

km S of Wyseby Jct, 7.xii.1985, J.T. Moss, A. Ewart (QM, Reg. No. T.11152).

PARATYPES: QUEENSLAND: 1♂, Injune-Rolleston Rd, 15 km S Wyseby Jct, 11.xii.1985, J.T. Moss, A.E. (ANIC). 1♀, Injune-Rolleston Rd, 15 km S Wyseby Jct, 7.xii.1985, J.T. Moss, A.E. (QM). 3♂♂, Injune-Rolleston Rd, 15 km S Wyseby Jct, 11.xii.1985, J.T. Moss, A.E. (JM). 50♂♂, 46♀♀, Clermont, 7.ii.1981, M.S. and B.J. Moulds; 2♂♂, L. Broadwater nr Dalby, site A, 27°21'S 151°06'E, 24.xii.1986, G. and A. Daniels, mv lamp; 13♂♂, Yelarbon, 17.xi.1962, M.S. Moulds (MSM). 1♂, dry scrub country on tree trunk, 15 km S of Amby, 4.ii.1982 A.E.; 1♂, Augathella, xi.1978, M. Hawkins; 1♂, Clermont, 7.ii.1981, M.S. and B.J. Moulds; 1♂, 51 km N of Injune, Injune-Rolleston Rd, 7.xii.1985, J.T. Moss, A.E.; 1♂, 93 km N of Injune, Injune-Rolleston Rd, 7.xii.1985, J.T. Moss, A.E.; 7♂♂, 1♀, L. Broadwater, 30 km SW Dalby, casuarinas, 17.xii.1987, A.E.; 1♂, L. Broadwater, S side lake, 30 km SW Dalby, 17-20.xii.1987, A.E. (AE). NEW SOUTH WALES: 3♂♂, 1♀, Nandewar Range Foothills, 15.xii.1971 (M46), J.T. Moss (JM).

ETYMOLOGY

Derived from Latin *siccanus*, meaning dry. This refers here to the inland dry country occurrence of this insect.

DESCRIPTION

MALE: Head: Postclypeus; shiny black anteriorly with clearly defined brown margin and conspicuous pallid area dorsally on midline; dorsal surface black with median thin pallid fascia extending to, and broadening adjacent to frontoclypeal suture; silvery pubescence anteriorly. Anteclypeus shiny black with silver pubescence. Rostrum brown becoming black apically; extends just beyond mid coxae, but not to hind coxae. Gena and mandibular plate black with intervening narrow brown suture and marginal ridges; conspicuous silver pubescence. Antennae deep brown. Vertex lobes brown. Ocelli pink. Eyes dark brown. Dorsal surface of head black with pallid triangular area on longitudinal suture between ocelli; silver pubescence especially conspicuous behind eyes.

Thorax: Pronotum black with narrow brown anterior margin and pronotal collar, and pale broad central fascia which does not extend to pronotal collar; two small dorsolateral pale triangular areas adjacent to pronotal collar; short silver pubescence.

Mesonotum black with a pair of dorsolateral pale greenish-brown fasciae, widening inwards medially; cruciform elevation pale reddish-brown, black anteriorly; wing grooves pale brown; silver pubescence adjacent to wing grooves and cruciform elevation.

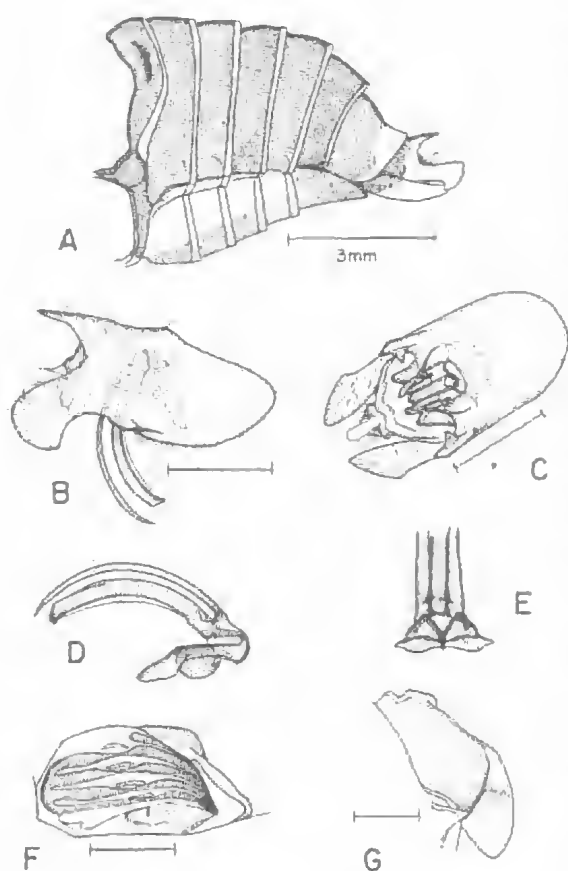


FIG. 26. *Pauropsalta siccanus* sp.n., ♂, from Injune-Rolleston road, 93 km N of Injune (central southern Queensland). Symbols A to G, and scales, as in Fig. 2.

Legs: Coxae black with brown outer margins on fore coxae; femora black, with paler diffuse longitudinal fasciae on fore femora; tibiae black; fore tarsi black, becoming paler on mid and hind tarsi; claws and spines black to dark brown.

Wings: Venation dark brown, paler along costal and sub costal veins of fore wings, and adjacent to anal lobes of hind wings; very distinct and diffuse infuscation on hind wings at termination of 2A vein, and a second very distinct infuscation in clavus, adjacent to plaga.

Tymbals: Dorsal ridge short and relatively wide; three central ridges relatively wide; the three or four lower ridges joined anteriorly; basal spur indistinct or absent.

Opercula: Broadly sickle-shaped, elongated, with sharply elevated central region; relatively sharply rounded inward (posterior) termination; marginal declivious flange around outer margin:

colour dominantly black except for pale brown zone adjacent to posterior margin; surface finely rugose.

Abdomen: Tergites 2 to 8 black with conspicuous yellow to yellow-orange posterior margins; posterior margin of tergite 8 irregularly yellow-brown. Sternites III to VI yellow-brown with broad, dark median fascia; sternite VII dark brown to black; sternite VIII dark anteriorly, otherwise pale brown.

Genitalia: Pygophore black anteriorly, otherwise pale sandy-brown; upper lobes hypertrophied and tending to be developed into a shallow hook-like shape; inner and lower lobes distinct, with the pair of inward pointing, curved, triangular-shaped spur-like processes developed from lower lobes; a pair of hooked claspers; dorsal, curved pseudoparameres longer than endotheca, and which bifurcate and join endotheca near, but not adjacent to gonocoxite IX; endotheca cylindrical and curved.

FEMALE: Colouration and markings similar to male, with head and thorax identical. Legs slightly paler, with prominent longitudinal pale fasciae on fore femora. Tergites 2 to 8 dominantly black, but with narrow and irregular transverse, pale brown bands adjacent to posterior margins of each tergite; tergite 9 dorsally and anteriorly black, otherwise pale sandy-brown with posterior lateral black spot. Sternites pale yellow-brown with prominent median dark fascia. Ovipositor sheath black, extending beyond tergite 9 by up to approximately 0.5 mm.

MEASUREMENTS: 8♂♂ and 2♀♀. Body length: ♂ 12.7-14.7 (13.58); ♀ 13.7-14.2. Fore wing length: ♂ 15.2-16.8 (16.13); ♀ 16.8-17.0. Head width: ♂ 4.0-4.6 (4.30); ♀ 4.4-4.5. Pronotum width: ♂ 3.3-4.0 (3.68); ♀ 3.5-3.8. Abdomen width: ♂ 4.0-4.8 (4.39); ♀ 4.0.

COMMENTS

This species is similar to *P. corticinus*, *P. fuscata* and *P. collina*, and could also be confused with *P. annulata* (see descriptions). The most useful characters for distinguishing *P. siccanus* from these species are the two distinct infuscation spots on each of the hind wings, together with the broad dark fascia on the ventral side of the abdomen. In the field, the 'chirping' song of *P. siccanus* is very characteristic, and, in fact, enabled its initial discovery. The short thick dorsal tymbal ridge is also a useful male distinguishing character.

DISTRIBUTION

This species occurs through central to southern central Queensland, from Clermont south through

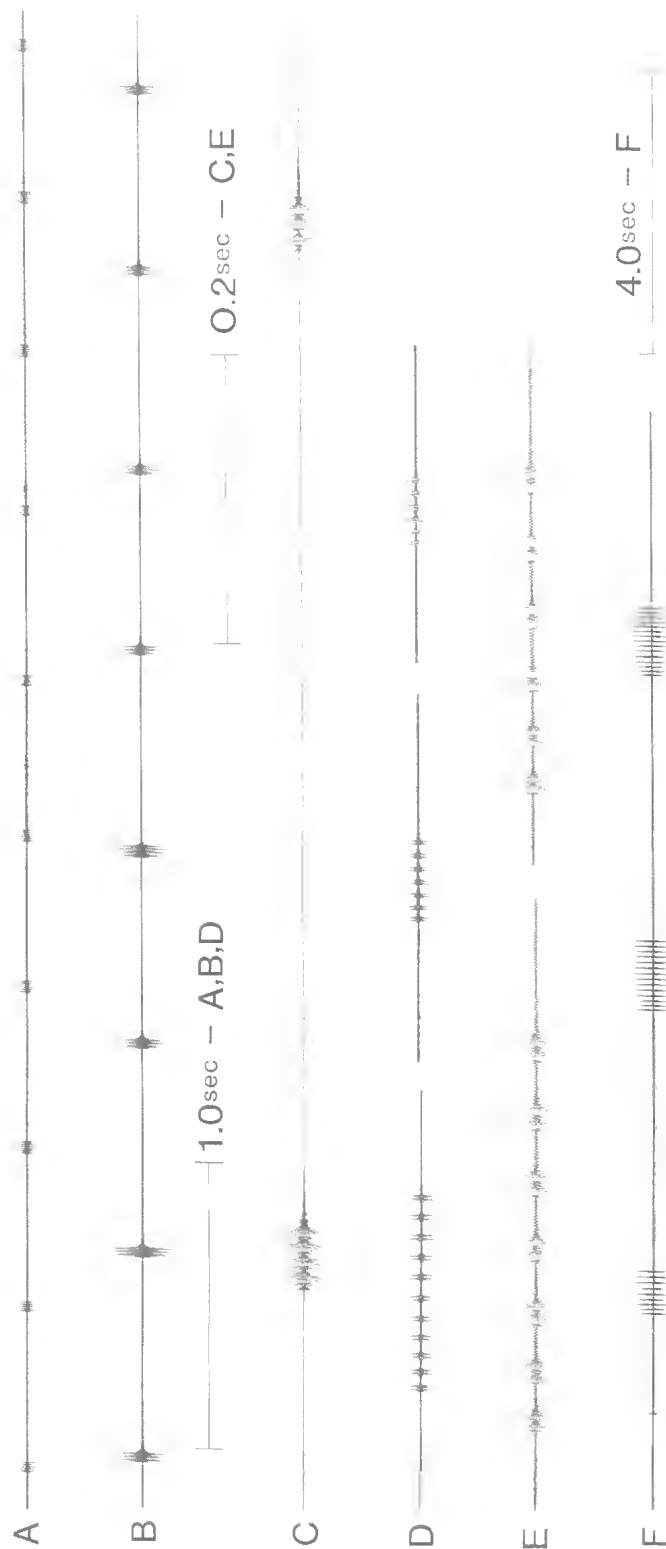


FIG. 27. Oscillograms of three sets of calling songs of *P. siccanus*. A to C, near Wyseby, Rolleston-Injune road (December, 1985). A; recorded in field; B, C, recorded in captivity. A and B (representing separate specimens) are shown at the same time scale. D and E, Lake Broadwater (30 km SW Dalby; Dec. 1988; two different time scales). F, 15 km E of Narrabri, base of Nandewar Ranges (December 1971; JM).

Wyseby (Injune-Rolleston road), to Amby and Augathella, and southeast to near Dalby and Yelarbon (near Goondiwindi) (Fig. 57). In New South Wales, it has been collected only from the base of the Nandewar Ranges, near Narrabri. The preferred habitat is dry, open, eucalyptus-casuarina-callitris mixed woodland. It appears to be localised in these areas.

SONG

The calling song consists of a continual series of short 'chirps' (Fig. 27). The oscillograms show it to comprise distinct and separate phrases, the detailed structures of which exhibit distinct regional variations, detailed as follows:

Wyseby song (Fig. 27A-C): Each phrase consists of between 3 to 6 discrete pulses (each a compound pulse group). The time intervals between phrases, measured for two songs from separate insects, are 0.52-0.59 (mean 0.55) and 0.61-0.73 (mean 0.67) sec. The total duration of each pulse group is 30-40 msec, with mean intervals of 8 and 11 msec between pulses measured on the two separate songs. Expanded time scale oscillograms show that each compound pulse group is preceded by an additional small amplitude single pulse, with a 2 msec interval.

Lake Broadwater song (Fig. 27D-E): Phrase lengths vary between 0.2 to 0.7 sec, while interphrase intervals are variable (approximately 1 to 1.5 sec). Each phrase comprises clearly defined double pulses (each a compound pulse group), with between 6 to 11 doublets per phrase; the phrases, therefore, are markedly longer than observed for the Wyseby specimens (confirmed by additional field aural observations). Intervals of 8-10 msec occur between each pulse group comprising the pulse doublets, while intervals between the double pulses progressively increases from 24 to 38 msec during the emission of each phrase. The detailed structure of each pulse group is similar to the Wyseby song, each of 30-40 msec duration, and each also preceded (by approximately 2 msec) by an additional small amplitude single pulse.

A single song record from the base of the Nandewar Ranges (Fig. 27F) is very similar to the Lake Broadwater *P. siccanus* song.

Paurosalta aktites n.sp. (Figs 28, 29, 32E, F, 57)

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND, Southport Spit, SEQ, 12.iii.1978, A. Ewart (QM, Reg. No. T.9188).

PARATYPES: QUEENSLAND: 1♂, 1♀, Southport Spit, 12.iii.1978, A.E. (ANIC). 1♂, 1♀, Southport Spit, 12.iii.1978, A.E. (BMNH). 1♂, 1♀, Beach, Mon Repos, Bundaberg, 30.i.1983, A.E. (MNDN). 1♂, Brisbane, 16.x.1911, H. Hacker; 1♂, Brisbane, 15.ii.1916, H. Hacker; 1♀, Brisbane, 10.x.1917, H. Hacker (QM). 1♂, N Stradbroke Is., 1.iii.1980, H.E. and M.A. Evans and A. Hook Coll. (UQIC). 2♂♂, 3♀♀, Fraser Is., 22.i.1973, J.T. Moss; 1♂, Great Keppell Is., 4.xi.1983, J.T. Moss; 1♂, Hervey Bay, 8.i.1972, J.T. Moss; 1♂, Hervey Bay, 9.iii.1980, J.T. Moss (JM). 4♂♂, 1♀, Double Island Pt nr Tin Can Bay, 19.x.1986, R. Eastwood; 1♀, Eurong, Fraser Is., 4-14.xii.1977, A.E.; 1♂, Golden Beach, Caloundra, 18.xi.1979, A.E.; 2♂♂, L. Freshwater, S of Rainbow Beach nr Gympie, 12.xi.1982, G. Theischinger; 1♂, Tugun, nr Coolangatta, 8.x.1967, J. North (MSM). 2♂♂, Beach between Amity and Pt Lookout, Stradbroke Is., 10-11.i.1981, A.E.; 1♂, coastal dunes, Bribie Is., 20.i.1977, A.E.; 1♂, Coast, Bribie Is., 14.ix.1980, A.E.; 1♂, Caloundra, 29.ix.1979, A.E.; 11♂♂, 1♀, Beach front, Eurong, Fraser Is., 4-14.xii.1977, A.E.; 1♂, Golden Beach, Caloundra 21.x.1979, A.E.; 2♂♂, 28.x.1979, 1♂, 25.xi.1979, 3♂♂, 5.ii.1981; 1♂, 1♀, Labrador, nr Southport, iv.1976, A.E.; 17♂♂, 6♀♀, Beach, Mon Repos, nr Bundaberg, 30.i.1983, A.E.; 2♂♂, N Stradbroke, 18.xi.1972, A.E.; 2♂♂, N end of S Stradbroke Is., 4.xii.1971, A.E.; 1♂, iv.1975; 8♂♂, Southport Spit, 12.iii.1978, A.E.; 3♂♂, 1♀, 23.iv.1978, 1♂, 7.v.1978; 2♂♂, 1♀, S end Southport Spit, 5.ii.1987, A.E.; 2♂♂, Teewah beach front, 15.xii.1978, A.E.; 2♂♂, Waddy Pt, Fraser Is., in Casuarina sp., 15.xii.1977, A.E. (AE). NEW SOUTH WALES: 1♂, Avalon Beach, Sydney, 17.xii.1958, M.S. Moulds (QM). 1♂, 35.58S 150.09N, Congo, 8 km SE by E of Moruya, 18.xii.1981, M.S. Upton; 1♂, Crookhaven, 31.xii.1933, Fuller; 1♂, Cronulla, 19.xi.1968, J.T. Moss, 3♂♂, 29.xi.1970; 2♂♂, 1♀, Currarong Bch, 22.i.1966, J.T. Moss; 1♂, Durras, dunes behind beach, 1.ii.1973, D.H. Colless; 3♂♂, Elizabeth Bch, 9.xi.1969, J.T. Moss; 1♂, Evans Head, 27.i.1985, J.T. Moss; 1♂, 1♀, Port Macquarie, 2.xi.1984, J.T. Moss (JM). 1♂, Avalon Beach, Sydney, 4.xii.1958, M.S. Moulds, 21♂♂, 1♀, 17.xii.1958, 2♂♂, 18.i.1960, 2♂♂, 29.xii.1961, 1♂, 1.i.1962, 1♂, 29.xii.1969; 1♀, Avoca Beach, i.1980, S. Hunter; 3♂♂, Blackhead, nr Taree, 7.i.1972, M.S. Moulds; 1♂, 1♀, Bonny Hills, 24.xi.1980, swept from *Acacia longifolia*, G. and T. Williams; 2♂♂, Boomerang Beach nr Wallis L., 9.i.1972, M.S. Moulds; 2♂♂, Broken Head nr Byron Bay, 24.xii.1975, G. Daniels; 1♂, c. 1.5 km SW Crowdy Head, 21.x.1985, G. Williams, ex beach hind dune zone; 1♂, Culburra, 6.i.1986, S. and B. Underwood; 2♂♂, 1♀, Dee Why Lagoon, 5.i.1972, J.V. Peters; 2♂♂, Forster, 15.i.1971, G.R. Brown; 5♂♂, Forster, 6.i.1972, M.S. Moulds; 1♂, 6 km N of Harrington, 19.i.1981, on *Acacia longifolia* on beach dune, G. and T. Williams, 1♂, 1♀, 12.xi.1981; 1♀, Harrington, 24.ii.1981, G. and T. Williams; 1♀, c. 3 km N of Harrington, 8.xi.1982, on *Acacia longifolia* var. *sophorae* foliage; in cleared open area adjoining littoral rainforest and melaleuca swamp, G. and T. Williams; 1♂, Harrington, 8.ii.1983, on *Acacia longifolia*, G. and T. Williams; 1♂, 2-3 km N of Harrington, 9.x.1983, on

Acacia longifolia var. *sophorae* foliage, G. Williams; 3♂♂, L. Cathie, 24.xi.1980, swept from dune vegetation on beach, G. and T. Williams; 1♂, c. 3 km N of Laurieton, 2.x.1983, on *Acacia longifolia* var. *sophorae*, on beach hind dunes, G. Williams; 1♂, Mainbar, 7.xii.1967, A.D. Cliff; 2♂♂, Manning Pt, E of Taree, 9.xi.1982, on *Acacia longifolia* var. *sophorae* on foredune of beach, G. and T. Williams; 1♂, Manning Pt, c. 12 km E Taree, 23.xii.1982, beaten from foliage in littoral rainforest-foredune vegetation interface, G. and T. Williams; 1♂, Manning Pt, E of Taree, 10.xi.1983, on littoral rainforest margin, G. and T. Williams; 1♂, Norah Head, 1.i.1972, G. Daniels; 9♂♂, 2♀♀, Ocean Beach, Umina, 5.xii.1977, M.S. and B.J. Moulds; 4♂♂, 2♀♀, Old Bar, nr Taree, 8.i.1972, M.S. Moulds; 1♀, Old Bar, 9.xi.1983, ex *Jacksonia* dom. shrub assoc., G. Williams; 1♂, Sandhills, Palm Beach, 10.i.1970, J.V. Peters; 6♂♂, Port Macquarie, 10.i.1972, M.S. Moulds; 1♀, Urunga, 23.i.1971, M.S. Moulds; 2♂♂, Wattamula, 24.xi.1968, G.R. Brown; 1♂, Woolli, 28.x.1962, M.S. Moulds. (MSM). 1♂, Hastings Pt, 6.x.1979, A.E. (AE).

ETYMOLOGY

Derived from the Latin *aktites* meaning shore or coast dweller.

DESCRIPTION

MALE: Head: Black with brown to reddish-brown markings. Postclypeus black anteriorly with reddish-brown margin, extending into grooves between transverse ridges; median brown area occurs dorsally on midline; silver pubescence between transverse ridges; dorsal surface black. Anteclypeus black with silver-white pubescence. Rostrum pale brown adjacent to anteclypeus, grading to black apically, and extending to mid coxae. Gena and mandibular plate black with conspicuous silver pubescence. Antennae black. Ocelli deep pink to red (apparently fading in some preserved specimens). Eyes medium brown with silver-white pubescence in region behind the eyes. Dorsal surface of head black with brown markings on anterior edge adjacent to postclypeus; short, sharply pointed, longitudinal sandy-brown fascia extending between lateral ocelli and posterior margin of head; gold-brown pubescence present, extending to dorsal surface of postclypeus. Vertex lobes black.

Thorax: Pronotum black with sandy-brown central fascia; pronotal collar medium brown; anterior margin, adjacent to head, dark to medium brown; short gold-yellow pubescence, particularly evident adjacent to oblique fissures.

Mesonotum black with sandy-brown dorsolateral fasciae which broaden dorsally towards each other midway along mesonotum, and which extend to the cruciform elevation.

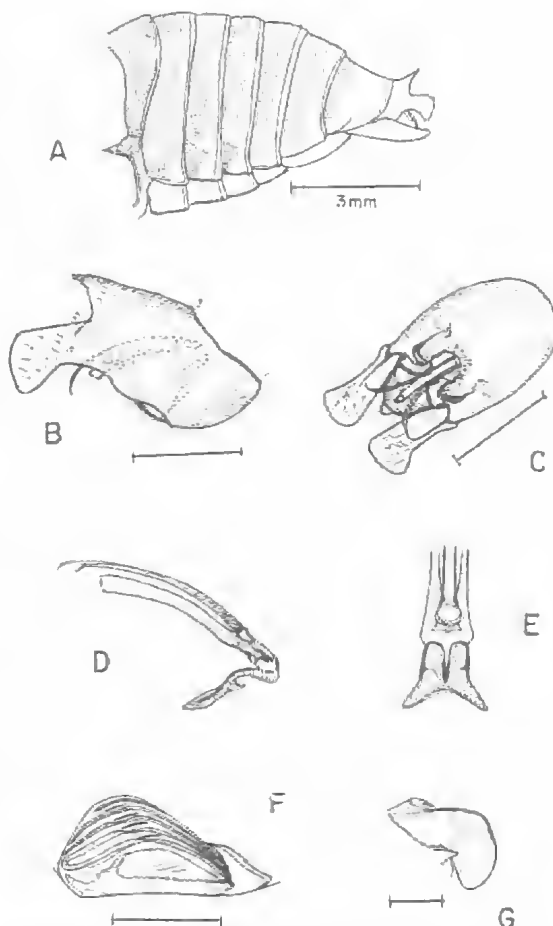


FIG. 28. *Pauropsalta aktites* sp.n., ♂, from Southport Spit, southern coastal Queensland. Symbols A to G, and scales, as in Fig. 2.

Cruciform elevation black anteriorly, becoming sandy-brown medially and posteriorly; sandy-brown colouration and silver pubescence extend along wing grooves and adjacent ridges; silver pubescence around cruciform elevation.

Legs: Coxae dark and medium brown; femora sandy-brown with longitudinal, broad, dark brown fasciae; fore tibiae and tarsi, and spines of fore legs dark brown; mid and hind tibiae and tarsi paler; claws dark brown.

Wings: Fore wing venation medium to dark brown, becoming darker distally towards apical cells and ambient veins, except the fore wing vein R+Sc which is notably paler; very faint infuscation along CuA₂ vein, proximally to join with vein 1A+2A; faint infuscation spot on hind wings, and also adjacent to plaga; slight angulation of fore wing at node.

Tymbals: Dorsal ridge extends across dorsal

inter-ridge sclerite; two lower ridges are joined anteriorly; small basal spur.

Opercula: Roughly sickle-shaped, broadly rounded apically; declivous flange most conspicuously developed along outer anterior margin; colour deep brown anteriorly grading outwards to sandy-brown in posterior region; surface appears finely rugose and is sparsely covered by silver pubescence; anterior central area broadly domed; posterior region somewhat longitudinally undulate (i.e. parallel to body axis).

Abdomen: Black pigmentation along anterior region of each tergite; tergites 2 to 8 exhibit a conspicuous reddish-brown zone extending around and adjacent to the posterior margins of each tergite (extending only dorsolaterally in tergite 2) and becoming broader towards tergite 8; posterior margins of tergites orange to yellow-brown. Sternites II brown; sternites III to VII reddish brown with irregular, patchy, and slightly darker markings, and a weakly developed (or absent) median darker region; posterior margins of sternites orange to yellow-brown; sternite VIII orange-brown. Silver pubescence generally conspicuous on lateral and dorsolateral areas of tergites, becoming more medially conspicuous on tergite 8; in some specimens, the silver pubescence also extends medially along all tergites, giving the appearance of a narrow dorsal abdominal stripe, tapering posteriorly.

Genitalia: Pygophore medium brown; somewhat ovoid in shape when viewed ventrally; upper lobes enlarged distally, with partially hook-like and relatively acute termination; spur-like structure extending from inner lobes is curved; claspers terminate apically with a hooked structure; endotheca slightly curved; bifid pseudoparameres are sharply tapering and curved apically; pseudoparameres join endotheca close to gonocoxite IX.

FEMALE: General markings and colouration closely similar to male. Ocelli deep pink. Pronotum exhibits pale sandy-brown area around posterior termination of central fascia, and adjacent to anterior oblique fissures. Mesonotum with dorsolateral brown fasciae broadened so as to join medially. Tergites with reddish-brown zones around posterior margins more extensively developed, and only minor black colouration on tergite 8; silver pubescence more extensively developed; tergite 9 medium brown with a pair of dorsolateral black fasciae extending three-quarters of the tergite length towards the posterior edge; ovipositor sheath does not extend beyond termination of tergite 9.

MEASUREMENTS: 46♂♂ and 13♀♀. Body length: ♂ 11.7-14.5 (13.28); ♀ 13.0-14.7 (13.76). Fore wing length: ♂ 14.0-17.3 (15.63); ♀ 15.2-17.3 (16.31). Head width: ♂ 3.8-4.5 (4.13); ♀ 4.3-4.6 (4.44). Pronotum width: ♂ 3.4-4.2 (3.73); ♀ 3.8-4.2 (4.04). Abdomen width: ♂ 3.6-4.5 (3.99); ♀ 3.7-4.2 (3.95).

COMMENTS

This species is similar to *P. rubea* (see following description), although their habitats do not normally overlap. Useful distinguishing male features include the intensity of the hind wing infuscation (conspicuous in *P. rubea*; weak in *P. aktites*) and the intensity of the black longitudinal fascia ventrally along the abdomen (distinct in *P. rubea*; weak to absent in *P. aktites*).

DISTRIBUTION

Southern New South Wales coast from Congo northwards to Great Keppel Island, central Queensland coast (Fig. 57). Confined to coastal vegetation on, and immediately behind, the strand and foredune complex (most commonly in *Casuarina equisetifolia*) usually within a 50 m strip but may extend for up to 200 m inland. The adults are active from September to May.

SONG

The song pattern consists of two regularly repeated phrases, an initial short followed rapidly by a long phrase, all of similar amplitude (Fig. 29). The song pattern may be modified by the insertion of an additional short phrase immediately preceding the long phrase (Fig. 29A-C), but even in the individual insect from which these oscillograms were produced (from Southport), the additional phrase was not always present. Similarly, Fig. 29E shows both the presence and

TABLE 2. Comparative data on calling song patterns of *P. aktites*

Part of Song Pattern	Location		
	Southport	Cooloolo	Bundaberg
(a) Duration of short phrase (msec)	av. 34.5 (31-41)	av. 32.6 (30-40)	av. 31.1 (30-38)
(b) Duration of long phrase (sec)	av. 1.44 (1.34-1.48)	av. 1.19 (1.10-1.29)	av. 0.95 (0.83-1.0)
(c) Duration between long phrases (sec)	av. 0.44 (0.40-0.47)	av. 0.26 (0.25-0.28)	av. 0.32 (0.29-0.36)
(d) Duration between short and following long phrases (msec)	av. 58 (51-62)	av. 25 (26-40)	av. 34 (25-38)

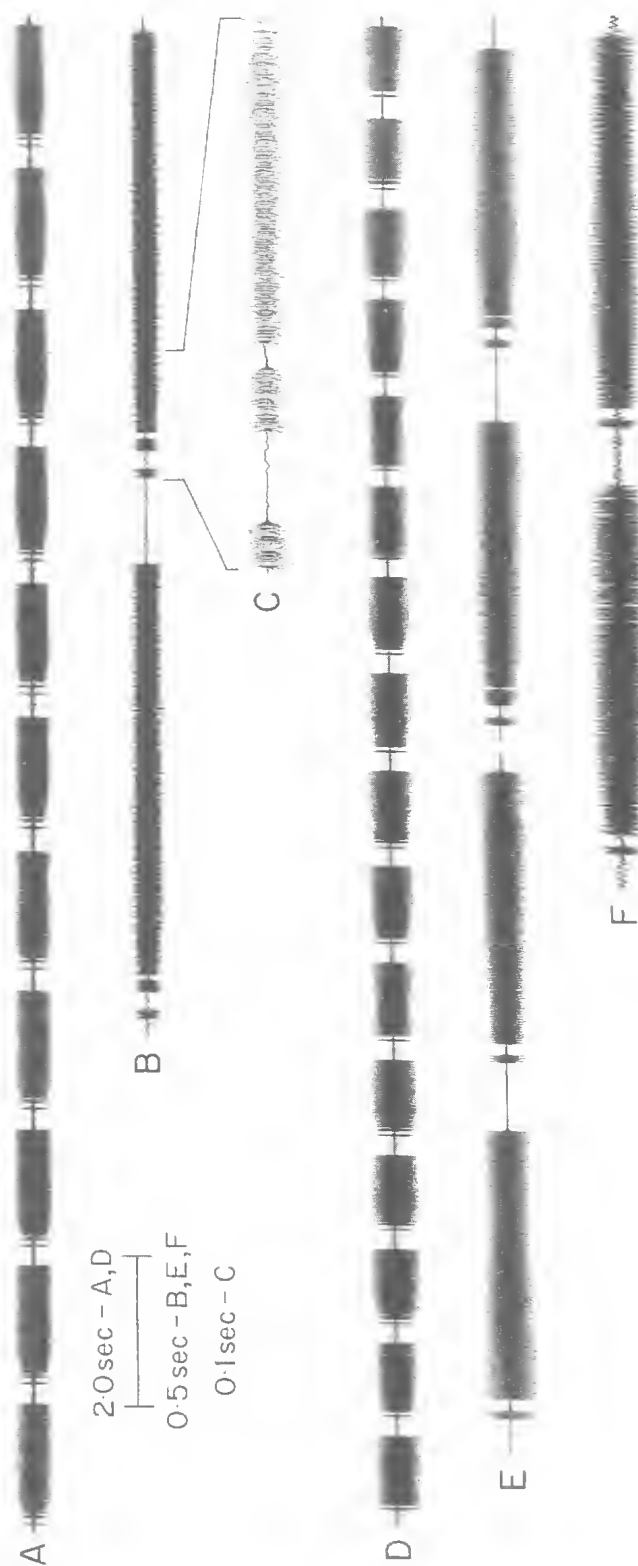


FIG. 29. Oscillograms of three sets of calling songs of *P. aktites*. A to C, Southport Spit (March, 1978); D, E, Mon Repos, near Bundaberg (Jan. 1983); F, Teewah, Cooloolah (Dec. 1978). Three different time scales are shown.

absence of the additional phrase from a Cooloola specimen.

Table 2 gives detailed durations of the song pattern, based on songs from three widely separated localities, parts of which are illustrated in the oscillograms (Fig. 29). These data suggest significant intra-specific song variability. On an expanded time scale, the songs are resolved into relatively high amplitude compound pulse groups, with a repetition frequency between 385-420 Hz, these superimposed on a background of low amplitude higher frequency pulse groups.

***Pauropsalta rubea* (Goding and Froggatt)
n.comb.
(Figs 30,31,32C,D,58)**

Melampsalta rubea Goding and Froggatt, 1904:651; Distant, 1906b:176; Burns, 1957:661; Duffels and van der Laan, 1985:291.

Cicadetta rubea (Goding and Froggatt) Kirkaldy, 1907:309; Metcalf, 1963:374; Dugdale, 1972:879.

Melampsalta geisha Distant, 1915:50,51; Burns, 1957:653; Duffels and van der Laan, 1985:285. *N. Syn.*

Cicadetta geisha (Distant) Metcalf, 1963:315.

MATERIAL EXAMINED

LECTOTYPE: ♂ of *Melampsalta rubea*, here designated, in ANIC. *Melampsalta rubea*, G. and F. ♂ Brisbane, Queensland; ex MM, and 'on permanent loan' to ANIC.

PARALECTOTYPE: ♀ from the same locality and has an additional label 'Brisbane, Dec. 1903 (J.B.)', ANIC.

HOLOTYPE: ♀ of *Melampsalta geisha* in BMNH: Stradbroke Is.: H. Hacker, 5.12.13 (the date being handwritten). Two additional labels give the number '8', and the numbers '19.14.346'. The accessions catalogue indicates that the latter refer to '18 cicadas, 100 Hymenoptera, Australia. Sent in exchange by the Brisbane Museum, Queensland 17.7.14 (25.ix.14)'.

OTHER MATERIAL: 20♂♂, 29♀♀ from following localities. QUEENSLAND: Brisbane; Fraser Is., Bob Gully; Kroombit Tops (upper Kroombit Ck), 45 km SSW Calliope; Stradbroke Is. (QM). Rockhampton (UQIC). Blackdown Tableland; Ewan Rd, 3-14 mi. W of Paluma; 7 km S Herberton; Kondalilla Falls, via Mapleton; L. Elphinstone, nr Glendon; 7 mi. W of Paluma, 3000 ft; 9 mi. W of Paluma, 2500 ft; Prince Henry Heights, Toowoomba, 620 m; Rainbow Beach; Roundhill Hd, nr Town of 1770 (JM). Coomanglah Range, 20 km NW of Monto; Wallaville (MSM). Blackdown Tableland; S end of L. Cootharaba; St Lucia, Brisbane (AE). NEW SOUTH WALES: Newport (Sydney) (MV). Berowra Waters, Hawkesbury R.; Palm Beach (Sydney); Wollombi (on Wisemans Ferry to Singleton Rd) (JM). Avalon Beach, Sydney; Failford, nr Taree; 1-2 km N of Kew, dry scler. forest; Old Bar, Jacksonia dominated shrub assoc.; c. 2 km SW Old Bar via Taree; cent. sect. Yarratt S.F., NE Wingham, dry scler. forest (MSM).

DESCRIPTION

MALE: Head: Postclypeus; anteriorly black with broad, pale brown margin; greenish, spindle-shaped fascia along lower third of midline, and a round greenish spot dorsally on midline, which extends on to dorsal surface; silver-yellow pubescence present, especially along grooves between transverse ridges; dorsal surface mainly black with short yellowish pubescence. Anteclypeus shiny black with conspicuous silver pubescence. Rostrum pale brown, becoming darker apically, and extending between mid and hind coxae. Mandibular plate black with long silver pubescence. Gena mainly black, becoming brown adjacent to eyes, and covered by silver pubescence; suture between gena and mandibular plate pale brown, extending along lateral clypeal clefts. Antennae deep brown, becoming pale

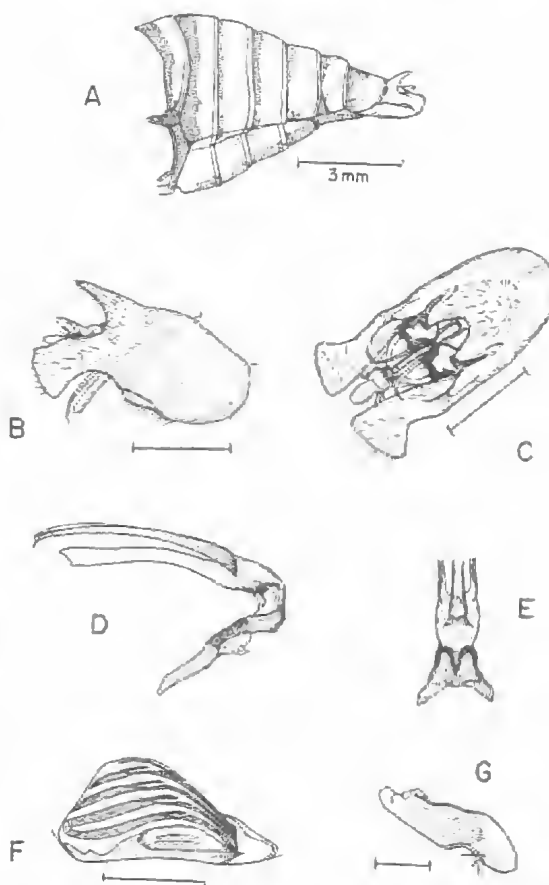


FIG. 30. *Pauropsalta rubea* (Goding and Froggatt) comb.n., ♂, from southern end of Lake Cootharaba, southern Queensland. Symbols A to G, and scales, as in Fig. 2.

brown apically. Ocelli cherry-red. Eyes dark brown (mottled in some dried specimens). Dorsal surface of head black, becoming brown adjacent to posterior margin of head; pale green triangular cleft, anteriorly pointing, situated between the ocelli, and extending to posterior edge of head; short yellowish pubescence, most conspicuous behind eyes. Vertex lobes greenish-brown.

Thorax: Pronotum pale reddish-brown, with pale greenish-brown, broad central fascia which narrows posteriorly, but widens abruptly into an outward pointing, wedge-shaped pattern (with small median black spot) adjacent to pronotal collar; irregular and broken black markings along and between the oblique fissures; pronotal collar pale brown; short silvery-yellow pubescence.

Mesonotum pale greenish-brown with irregular triangular-shaped lateral fasciae, which broaden anteriorly adjacent to pronotal collar; broad obconical dorsolateral black areas adjacent to pronotal collar; cruciform elevation pale green medially, pinkish-brown along radiating arms, black laterally and anteriorly between arms; silver-yellow pubescence especially conspicuous around cruciform elevation, and adjacent to wing grooves.

Legs: Fore and mid coxae predominantly black on inner and anterior margins, brown on outer margins; hind coxae black; silver pubescence conspicuous; fore femora black on inner margins, with longitudinal, broad, black and brown fasciae on outer margins; mid and hind femora medium brown with single black longitudinal fascia on anterior margins; fore tibiae and tarsi dark brown, becoming progressively paler on the mid and hind legs respectively; spines and claws dark brown.

Wings: Venation of fore wings reddish-brown, dark brown along anterior edge of costal veins; pterostigma reddish-brown; venation of hind wings brown, with infuscation spots dark brown and clearly visible.

Tymbals: Dorsal ridge extends across dorsal inter-ridge sclerite; the two lower ridges joined anteriorly; distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated; central region shiny, domed, dark brown; posterior region pallid; declivous flange along outer margin; broadly longitudinally undulate (i.e. parallel to body axis).

Abdomen: Each tergite with black anterior band passing irregularly to reddish-brown colouration which covers the dominant areas of tergites, and increases in extent towards tergite 8; tergite posterior margins pale green; short silver pubescence present, especially dorsolaterally and laterally on all tergites, and also dorsally on

tergites 2 and 3. Sternites III to V yellow brown to reddish-brown, with diffuse dark grey to black median region which broadens progressively towards sternite VI, and extends across much of sternite VII; sternite VIII, medium brown; sternite II predominantly dark grey; short silver pubescence present.

Genitalia: Colour reddish-brown grading irregularly to black anteriorly; upper pygophore lobes slightly decurved, somewhat flattened along distal margin, and asymmetrically acute; lower lobes tapering, rounded apically, and posteriorly pointing; claspers contain a pair of hooked processes; aedeagus with dorsal pseudoparameres, apically acute and tapering, which join the endotheca near gonocoxite IX.

FEMALE: General colouration and patterning similar to male, but with less black colouration. Head: Postclypeus brown with ventral and dorsal pale green to brown areas along midline; dorsolateral black colouration reduced compared to male, although more extensive along transverse ridges; dorsal surface pale brown; dorsal surface of head medium brown marginally, with central irregular black area enclosing ocelli, and pallid depressed fascia or suture extending from between ocelli to posterior margin of head; vertex lobes pale brown. Pronotum as in male, with reduced area of black markings. Mesonotum: Black dorsolateral and lateral fasciae reduced in extent compared to male, the main colouration being pale brown; cruciform elevation pink to pale brown with black markings extending around anterior and lateral margins. Legs similar to male, with reduced black and increased brown colouration on coxae and femora. Abdomen: Tergites predominantly reddish-brown with very narrow darker anterior markings which extend dorsally to laterally on tergites 2 and 3, but only dorsally on tergites 4 to 7; tergite 8 reddish-brown grading to pale brown posteriorly; tergite 9 pale brown with indistinct dorsolateral fasciae; posterior margins to tergites pale greenish-brown. Sternites reddish-brown to brown, with deep brown to black broad median fascia, interrupted by pale sandy-brown posterior margins of sternites; ovipositor sheath does not extend significantly beyond termination of tergite 9.

MEASUREMENTS: 12♂♂ and 9♀♀. Body length: ♂ 13.5-16.0 (14.87); ♀ 14.5-16.5 (15.47). Fore wing length: ♂ 17.3-20.0 (18.46); ♀ 17.8-20.0 (18.72). Head width: ♂ 4.4-5.3 (4.78); ♀ 4.6-5.2 (4.93). Pronotum width: ♂ 3.7-4.6 (4.08); ♀ 3.7-4.4 (4.11). Abdomen width: ♂ 4.0-4.8 (4.31); ♀ 3.9-4.3 (4.10).

COMMENTS

A matching female specimen to the type of *M. geisha* is held in QM with the following labels: 'Stradbroke Island H. Hacker 5.12.13'; 'Ho/2649'; '8'; 'Type series'; '*Melampsalta geisha* Distant'. The original description of *M. rubea* clearly refers to both a male and female pair from Brisbane, although only the female paralectotype bears a Brisbane locality label. The original description corresponds to the two specimens, especially in regard to their relatively strong red colouration which suggests fresh emergence when captured. They are thus interpreted as the syntypes. Examination of the types of *M. rubea* and *M. geisha* indicates that they are conspecific, and were in fact, collected from very close locations.

This species is close to *P. aktites*, and distinguishing features have been previously listed. Another similar species is *P. marginata* and both species occurring in similar and often overlapping habitats; song patterns are quite distinct. Distinguishing features are the relative lengths of the dorsal tymbal ridges in males (short, not extending across dorsal inter-ridge sclerite in *P. marginata*; longer, extending across dorsal inter-ridge sclerite in *P. rubea*); in females of *P. marginata*, the ovipositor sheath extends 3-4mm beyond termination of tergite 9, whereas in females of *P. rubea*, the ovipositor sheath does not extend significantly beyond tergite 9.

DISTRIBUTION

Eastern Australia, from Sydney to near Herberton in northern Queensland (Fig. 58). The apparent gap between the central New South Wales and southern Queensland regions probably reflects lack of collecting. Through much of its range, it occurs locally and relatively sparsely in tall open dry forest where the males are heard, but rarely caught or seen. It normally prefers the higher and outer canopy of the forest, rarely found low down, except for ovipositing females. It does, however, occur in the dry forest and scrub communities of the coastal lowlands, and dune complexes as on North Stradbroke and Bribie Islands (immediately inland of the zone in which *P. aktites* occurs). It appears to prefer more elevated environments in the northern part of its range. It occurs from October to April.

SONG

A regularly repeated sequence of phrases, all of approximately constant amplitude, four (or less commonly five) in number (Fig. 31). The duration

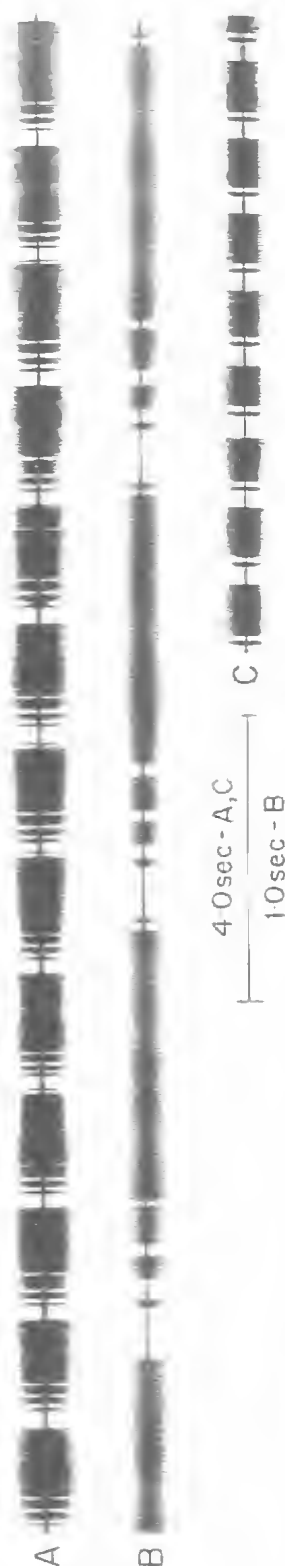


FIG. 31. Oscillograms of calling songs of *P. rubea* from: A, B, North Stradbroke Island, southern Queensland (Jan, 1981); C, Wollombi, New South Wales (Dec. 1981, JM). Records shown at two time scales.

of each phrase progressively increases in length, the final phrase being relatively long, with a duration of 0.78-1.09 sec. Intervals between these final long phrases vary between 0.5-0.78 sec. The intermediate shorter phrases have average durations of 28, 42, 93, to 133 msec, as the song progresses, respectively. The pulse structure of the whole song pattern is similar, being composed of very closely spaced, and overlapping composite pulse groups, with estimated durations of 10-11 msec. In Figure 31, the Stradbroke Island song is compared with one recorded at Wollombi, New South Wales (JM). The latter song comprises a short phrase (approximately 72 msec duration) followed, after a pause of similar duration (70 msec), by a long phrase (average duration 0.59 sec), with the duration between long phrases averaging 0.38 sec. This song thus differs in detail from the S Queensland song pattern, although the insects are morphologically very similar, suggesting regional song variability.

***Paupropsalta marginata* (Leach) n. comb.
(Figs 32A, B, 33, 34)**

- Tettigonia marginata* Leach, 1814:89, Pl. 39, fig. 1.
Cicada marginata (Leach) Walker, 1850:173, Dohrn, 1859:74.
Cicada themiscura Walker, 1850:177, 178; Dohrn, 1859:74; synonymized by Distant, 1906b:170.
Melampsalta marginata (Leach) Stål, 1861:619; Goding and Froggatt, 1904:646; Ashton, 1912c:80; Ashton, 1914:353; Hardy 1918:71; Kato, 1932:187; Burns, 1957:657; Duffels and van der Laan, 1985:287.
Melampsalta themiscura (Walker) Stål, 1862:484; Distant, 1882:130.
Melampsalta fletcheri Goding and Froggatt, 1904:640, 641; Distant, 1906b:176; synonymized by Ashton, 1912c:80.
Cicadetta marginata (Leach) Kirkaldy, 1907:308; Metcalf, 1963:329, 330; Dugdale, 1972:877; Ewart, 1986:51, 54, fig. 3c; Ewart, 1988:182, figs 9F, G, Pl. 1E.
Cicadetta fletcheri (Goding and Froggatt) Kirkaldy, 1907:309.

MATERIAL EXAMINED

HOLOTYPE: ♂ of *Tettigonia marginata*, HEC (Hem. Type 784) (Ewart, in press): 'Marginata L.Z39.NH'. This is interpreted as L = Leach; Z = Zoological Miscellany; 39 = Plate 39; NH = New Holland.

HOLOTYPE: ♂ of *Cicada themiscura* in BMNH: No locality data.

HOLOTYPE: ♂ of *Melampsalta fletcheri* in MV: New South Wales; Goding Type, det. by Goding 10-04.

OTHER MATERIAL: 80 ♂♂, 60 ♀♀ from following localities. QUEENSLAND: Brisbane (BMNH). Brisbane (MV). Brisbane; Stradbroke Is (QM). Biggenden; Blackdown Tableland; Caloundra; Hervey Bay; Mt

Walsh N.P., Bluff Range, 1000 m; Pomona (JM). Amity swamp, N Stradbroke Is.; Beerburrum; Blackdown Tableland; Boolimba Bluff, Carnarvon N.P.; Caloundra; Doolandella, Brisbane; Kroombit Tops, Dawes Range; L. Broadwater, nr Dalby; Mt Moffatt N.P. (AE). NEW SOUTH WALES: Sydney (BMNH). Broadwater N.P., via Evans Head; Howes valley, Putty Rd; Mt Loftus, nr Sutherland; Mulgoa, nr Penrith (JM). Doyalson, nr Morrisset; Loftus (AE).

DESCRIPTION

MALE: Head: Postclypeus shiny black anteriorly with a relatively narrow reddish-brown outer margin, and a dorsal median brown spot on midline extending to dorsal surface; sparse silvery-gold pubescence, especially in grooves between transverse ridges; dorsal surface predominantly black. Anteclypeus black with prominent silver pubescence. Rostrum medium brown, becoming darker apically; extends to mid coxae. Gena and mandibular plate black with prominent silver pubescence. Antennae dark brown. Ocelli pink-brown. Eyes medium brown. Dorsal surface of head black with fuscous triangular area between ocelli, anteriorly pointing and extending from posterior margin of head; golden pubescence especially prominent behind eyes. Vertex lobes reddish-brown.

Thorax: Pronotum black with lanceolate-shaped pale brown central fascia, and dorsolateral pale brown wedge-shaped fasciae adjacent to reddish-brown to brown pronotal collar; short golden pubescence mainly concentrated in dorsolateral and lateral region.

Mesonotum: Broad, black lateral and dorsolateral fasciae; black median fascia coalescing anteriorly with dorsolateral fasciae, and posteriorly broadening adjacent to cruciform elevation; remaining area pale pink-brown to medium brown; silver-gold pubescence especially prominent around cruciform elevation and along wing grooves and adjacent ridges.

Legs: Coxae black with brown longitudinal fasciae along margins of fore coxae; femora medium brown with dark brown longitudinal fasciae; fore and mid tibiae and tarsi brown, being somewhat paler on hind legs with darker longitudinal fasciae; claws and spines dark brown to black.

Wings: Fore wings with dark brown venation, except very pale along costal vein, and pale pink-brown R+Sc and Sc veins; pterostigma black; extremely faint infuscation along CuA₂ vein close to join with 1A+2A vein; small but clearly defined infuscation spots on hind wings.

Tymbals: Dorsal ridge does not extend across

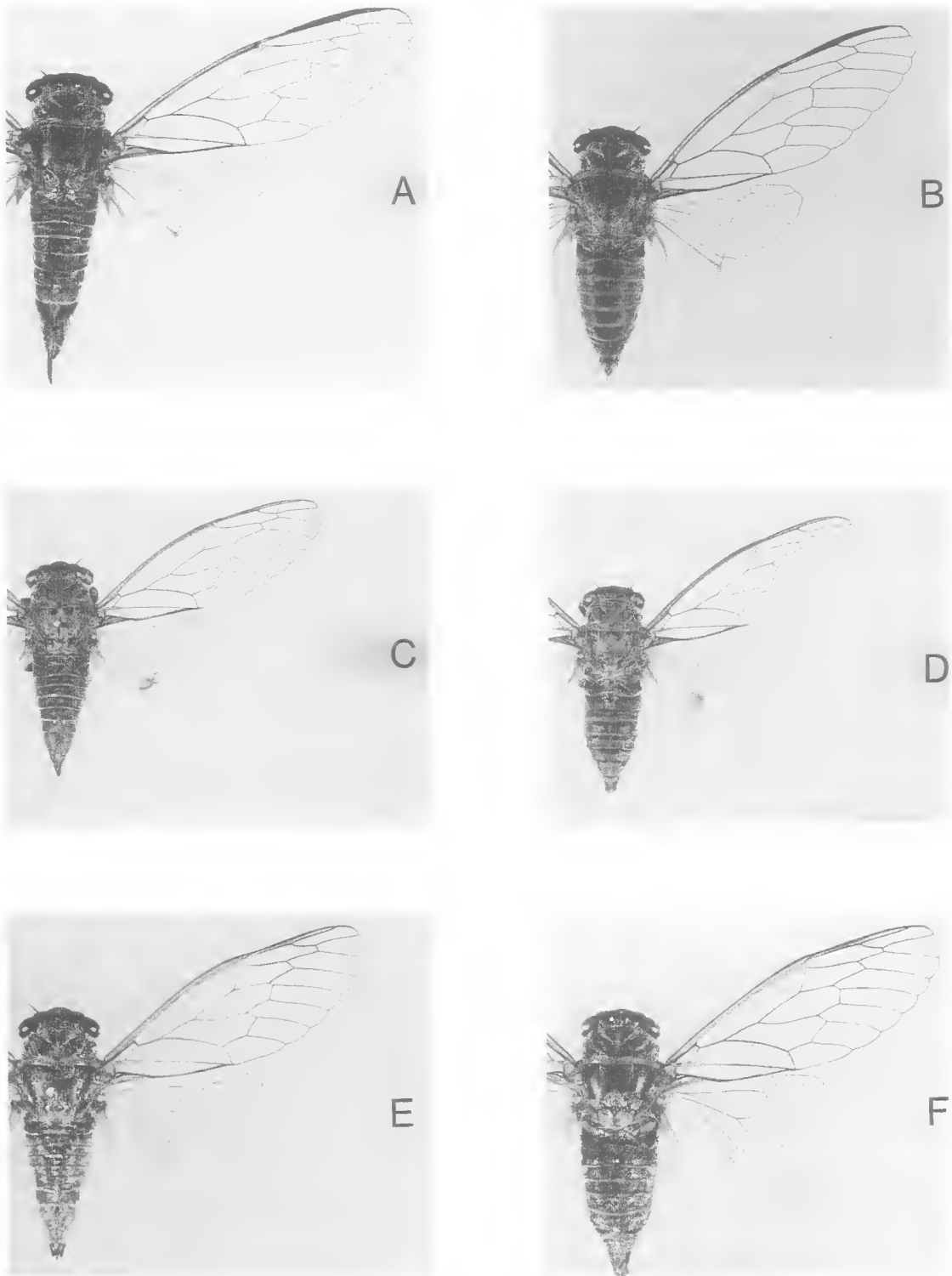


FIG. 32. A,B *P. marginata* ♀, ♂. C,D *P. rubea* ♀, ♂. E,F *P. aktites* ♀, ♂. Photographs A to D $\times 2$ natural size; E,F $\times 2.7$ natural size. Photographs: D.M. Reeves.

dorsal inter-ridge sclerite; three lower ridges joined anteriorly; distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated; somewhat domed and shiny centrally, with posterior region broadly undulate with slightly rugose surface; declivous flange along outer margin; colour dark brown on antero-medial region, becoming pale sandy-brown posteriorly and along outer margin.

Abdomen: Tergites 2 to 7 black with narrow reddish-brown zones developed adjacent to posterior margins, these zones not extending dorsally across each tergite; posterior margins of each tergite yellow-brown to orange; tergite 8 brown; short silver-gold pubescence most noticeable laterally and dorsolaterally. Sternites II to V orange-brown to brown, becoming reddish-brown towards sternites VI and VII; sternite VII marked by relatively large, black median area; sternites III to VI have smaller median, triangular black regions, anteriorly pointing, adjacent to posterior margin of each sternite; sternite II black medially; sternite VIII brown, darker anteriorly.

Genitalia: Pygophore black anteriorly, elsewhere brown; upper lobes form a pair of blinker-like structures, slightly twisted and decurved, with asymmetric terminations; claspers with anterior-pointing hooked processes; aedeagus with a pair of dorsal pseudoparameres, joined to endotheca near gonocoxite IX; pseudoparameres bifurcate distally, i.e. away from junction with endotheca, being sclerotised, tapering, acute, and with slight apical ornamentation.

FEMALE: Colouration and markings very similar to male, with some decrease in the proportion of black pigmentation. Head: Dorsal surface of head black with scattered brown markings. Thorax: Pronotum with pale brown and broader central fascia than in male, abruptly widening adjacent to pronotal collar. Mesonotum with black median fascia absent posteriorly, except for small black area adjacent to cruciform elevation. Legs: Pale to medium brown with longitudinal black fasciae only on coxae, and dark brown claws and spines. Abdomen: Black pigmentation on tergites reduced in area, the main colouration being reddish-brown, grading to orange laterally on tergites 2 and 3; tergite 9 medium brown with a pair of slightly curved black dorsolateral fasciae extending to near posterior edge of tergite. Sternites orange-brown with median triangular black areas, anteriorly pointing, along the posterior edge of each sternite, which become smaller from sternites V towards II; ovipositor sheath extends 3 to 4 mm beyond termination of tergite 9.

MEASUREMENTS: 13♂♂ and 13♀♀. Body length: ♂ 17.5-21.1 (19.15); ♀ 20.6-24.4 (22.63). Fore wing length: ♂ 21.1-24.4 (22.47); ♀ 22.6-26.4 (24.64). Head width: ♂ 5.6-6.4 (5.88); ♀ 5.7-6.8 (6.22). Pronotum width: ♂ 4.5-5.5 (4.90); ♀ 4.8-5.7 (5.18). Abdomen width: ♂ 4.7-5.5 (5.09); ♀ 4.6-5.4 (4.96).

COMMENTS

A second ?type, ♀, of *Melampsalta fletcheri*, of uncertain status, is held in ANIC. The location labels list the locality as 'Cooks R., NSW', and 'Sydney, 12.i.01, W.B.G.', ex MM and 'on permanent loan'. In the original description, a male specimen from the Museum of Victoria, Melbourne, is specifically cited, and this corresponds to the specimen in MV. The ANIC specimen, therefore, cannot be regarded as a type, although evidently a contemporary specimen.

This species is most closely allied to *P. rubea* and both partly overlap in habitats. Distinguishing features are given under the description of *P. rubea*.

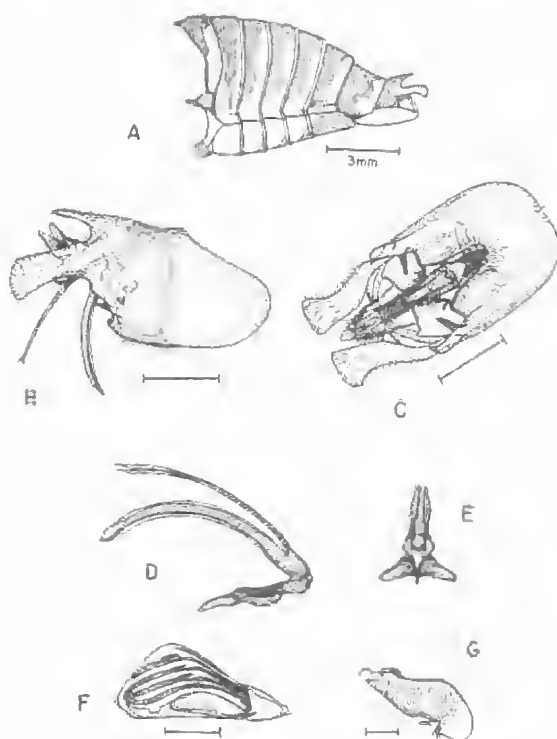


FIG. 33. *Pauropsalta marginata* (Leach) comb.n., ♂, based on specimens from Beerburum (north of Brisbane), and North Stradbroke Island. Symbols A to G, and scales, as in Fig. 2.

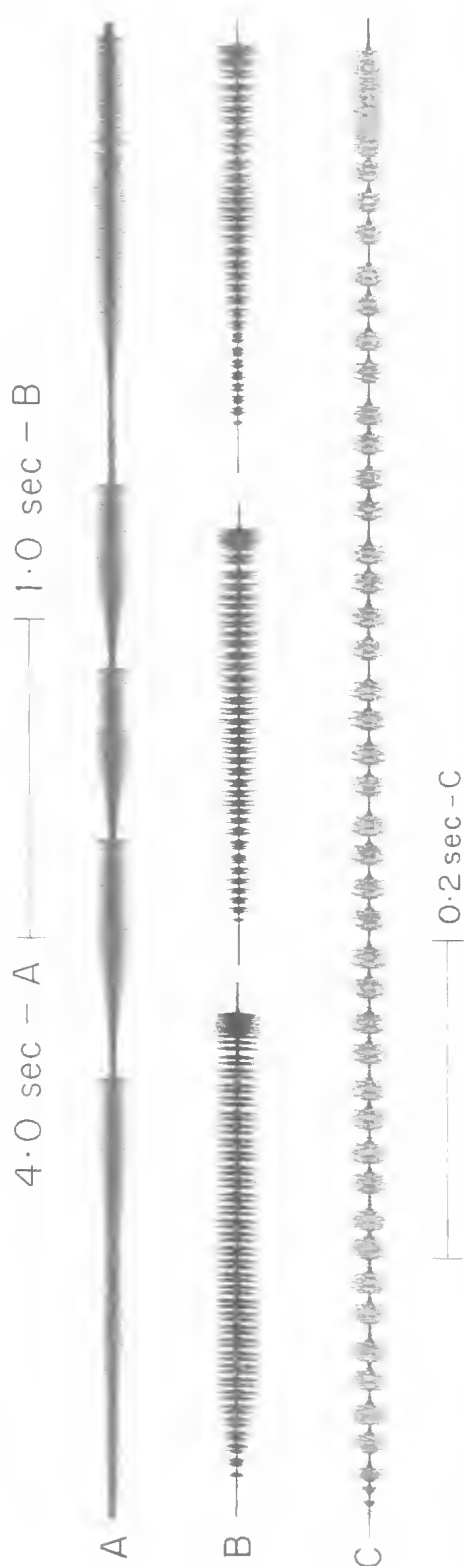


FIG. 34. Oscillograms of calling song of *P. marginata* from: A, Sutherland, Sydney (JM); B, southwestern Brisbane (first phrase) and North Stradbroke Island (second two phrases); C, further expanded time scale of southwestern Brisbane song phrase. Three time scales are shown.

DISTRIBUTION

Extends from Sydney, northwards through eastern New South Wales, southeastern Queensland to the Blackdown and Carnarvon tableland regions. It occurs in dry sclerophyll forest communities where the males normally sing from the higher trunks. Females, however, are frequently found near ground level ovipositing; plants on which oviposition has been observed include *Kunzia* sp., *Casuarina littoralis*, and *Eucalyptus trachyphloia*. It is active between October to April.

SONG

An irregularly repeated phrase, varying from 1.2 to 6.0 secs duration (Fig. 34). The interval between phrases varies from approximately 0.1 sec to many minutes. Each phrase initially has a progressive increase in amplitude which subsequently remains nearly constant. The final part of each phrase finishes with a short (70-85 msec) burst of increased pulse repetition frequency, giving the song its characteristic final tonal flourish, as heard by the ear. The expanded time scale (Fig. 34c) shows each phrase to consist of repeated double pulse groups, each showing a terminal damping, and each consisting of complex pulse triplets. The duration of each pulse group ranges between 12-16 msec, with an initial pulse of approximately 4-5 msec; intervals between the pulse group doublets is 8-14 msec; intervals between pulse groups forming each doublet is 4-6 msec. The final flourish of each phrase results from the merging of either two or three of the double pulse groups.

Pauropsalta vitellinus n.sp.

(Figs 8C,D,35,36,37,58)

Pauropsalta species E Ewart, 1988:182, figs 3,9E, Pl. 1D.

Pauropsalta sp. near *P. melanopygia* (Germar) St Leger Moss, 1988: 30.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND, L. Broadwater, c. 30 km SW of Dalby, SEQ, 12.ii.1984, A. Ewart (QM, Reg. No. T.11151).

PARATYPES: QUEENSLAND: 1♂, 1♀, Burnett R., N of Eidsvold, 330 ft, 9.i.1970, at light, EB/GH/IM; 1♂, 1♀, L. Broadwater, c. 30 km SW of Dalby, 12.ii.1984, A.E.; (ANIC). 1♂, 1♀, L. Broadwater, c. 30 km SW of Dalby, 12.ii.1984, A.E. (BMNH). 1♂, 1♀, L. Broadwater, 30 km SW of Dalby, 12.ii.84, A.E. (MNDN). 1♀, L. Broadwater, c. 30 km SW of Dalby, 12.ii.1984, A.E. (QM). 2♂♂, 2♀♀, Burnett R., N Eidsvold, el. 100 m, 9.i.1970, J.T. Moss; 5♂♂, Cardwell, 6.ii.1981, J.T. Moss; 4♂♂, 1♀, Chinchilla, i.1984, G. Lithgow; 1♂, 25

mi. N of Gin Gin, 23.iii.1958, I.F.B. Common; 3♂♂, Percy Is., SE Mackay, 8-10.xi.1983, J.T. Moss; 6♂♂, 3♀♀, Waruma Dam nr Eidsvold, 25.xii.1984, J.T. Moss (JM). 1♂, Barcalaine, 10.ii.1981, M.S. and B.J. Moulds; 6♂♂, 3♀♀, Bungil Ck, 16 km N of Roma, 20.i.1987, M.S. and B.J. Moulds; 6♂♂, 3♀♀, Burnett R. crossing, N of Eidsvold, 28.i.1988, M.S. and B.J. Moulds; 1♂, Butcher Ck, 20 km W of Cloncurry, 21.i.1977, M.S. and B.J. Moulds; 6♂♂, 5♀♀, Campaspe R. crossing, WSW of Charters Towers, 17.i.1984, M.S. and B.J. Moulds, (eyes dark brown); 10♂♂, 7♀♀, Cape R., 100 km S of Charters Towers, 21.xii.1983, M.S. and B.J. Moulds; 1♀, Cloncurry, 19.i.1984, M.S. and B.J. Moulds; 2♂♂, 2♀♀, Edungalba, 5.xii.1979, M.S. and B.J. Moulds; 5♂♂, 7♀♀, Isaacs R. crossing, Dingo/Mt Flora road, 24.i.1982, M.S. and B.J. Moulds; 1♂, 1♀, L. Broadwater, c. 30 km SW of Dalby, 12.ii.1984, A.E., 1♀, L. Broadwater nr Dalby, site B, 27°21'S 151°06'E, 30.i.1987, G. and A. Daniels, mv lamp; 5♂♂, 3♀♀, L. Broadwater, via Dalby, 9.xii.1987, Montelth and Thompson; 10♂♂, 9♀♀, Miles, 20.i.1982, M.S. and B.J. Moulds; 1♀, 'Mourangee' nr Edungalba, xii.1983, E.E. Adams; 2♂♂, 3♀♀, 1 km W of Mourangee Hsd, nr Edungalba, on tree trunks, 17.xi.1984, E.E. Adams; 1♂, 3♀♀, 1 km SW of Mourangee Hsd, nr Edungalba, on grey box, 19.xii.1985, M. and S. Adams; 1♂, 3♀♀, nr Mourangee Hsd, nr Edungalba, 6-7.xi.1987, on gum trunks, M. and S. Adams; 15♂♂, 8♀♀, creek at Mourangee Hsd, nr Edungalba, 20.xii.1987, M.S. and B.J. Moulds; 6♂♂, 9♀♀, Springsure, 15.xii.1979, P.S. Valentine; 2♂♂, 2♀♀, Torrens Ck township, 90 km E of Hughenden, 3.ii.1981, M.S. and B.J. Moulds, (Black eyes) (MSM). 1♂, 'Rockwood', nr Chinchilla, 4.ii.1983, C. Cameron; 24♂♂, 27♀♀, L. Broadwater, c. 30 km SW of Dalby, 12.ii.1984, A.E. (AE).

ETYMOLOGY

Derived from Latin *vitellinus*, meaning yellow (as in yolk of an egg), which refers to general colouration of the cicada.

DESCRIPTION

MALE: *Head:* Postclypeus shiny black anteriorly with a broad sandy-brown spot dorsally on midline; sparse silver-gold pubescence; dorsal surface black with yellow pubescence. Anteclypeus black with silver-yellow pubescence. Rostrum pale brown, becoming deep brown apically, extends to mid coxae. Gena and mandibular plate black with pallid intervening suture; prominent silver-yellow pubescence. Antennae medium to dark brown. Ocelli pale reddish-brown. Eyes medium brown. Dorsal surface of head black with pallid triangular area in suture between ocelli, anteriorly pointing, and extending from posterior margin of head; silver-yellow pubescence, especially prominent behind eyes. Vertex lobes pale brown.

Thorax: Pronotum with a pair of deep brown to black, somewhat rounded patches occurring

dorsolaterally to laterally i.e. around oblique fissures; remaining areas sandy-brown, except for small black, discontinuous zones adjacent to central fascia; central fascia pale sandy-brown; pronotal collar pale reddish-brown; anterior margin sandy-brown; short yellowish pubescence, mainly concentrated dorsolaterally and laterally.

Mesonotum: Broad black lateral fasciae extending from cruciform elevation, and which widen anteriorly; median fascia coalescing with dorsolateral fasciae, forming black, obconical anterior area on mesonotum, extending to beneath pronotal collar; posterior part of median fascia somewhat diffuse, merging with a pair of black dorsolateral spots immediately adjacent to cruciform elevation; remaining areas pale sandy-brown, including cruciform elevation; yellowish pubescence most conspicuous around cruciform elevation and along wing grooves and adjacent ridges.

Legs: Pale orange-brown with dark brown tips to spines and claws.

Wings: Fore wings with pale brown venation becoming progressively darker distally around apical cells and ambient vein; pterostigma pale brown; very faint narrow, brown infuscation along vein CuA₂ close to join with vein 1A+2A; infuscation spots on anal margins of hind wings are small.

Tymbals: Dorsal tymbal ridge extends across dorsal inter-ridge sclerite; the lower two, or in some specimens three ridges joined anteriorly; distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated; central region shiny, sandy-brown to yellow-brown, and somewhat domed; finely rugose surface; declivous narrow flange along outer margin; inward facing termination rounded; more or less longitudinally undulate (i.e. parallel to body axis).

Abdomen: Tergite 2 with conspicuous black anterior zone of pigmentation extending from dorsally to lower edge; posterior region of tergite 2 orange-brown; tergites 3 to 7 orange to yellow-brown, more deeply coloured along posterior margins, and with short, centrally placed, dorsal black bands which extend dorsolaterally in tergite 7; the extent of these black bands are, however, variable between individual specimens, and in some are completely absent (even in the one locality); tergite 8 is conspicuously black with narrow, irregular reddish-brown posterior margin, and very narrow, discontinuous, orange-brown anterior margin. Sternite II black medially, otherwise sternites II to VI orange, orange-brown

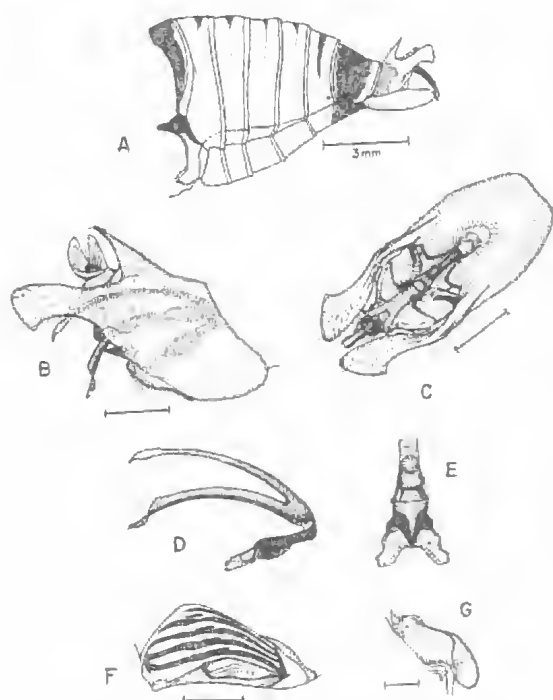


FIG. 35. *Pauropsalta vitellinus* sp.n., ♂, from Lake Broadwater, near Dalby, southern Queensland. Symbols A to G, and scales, as in Fig. 2.

to yellow; sternite VII orange anteriorly, black posteriorly; sternite VIII with anterior black patches of pigmentation, otherwise orange-brown to brown.

Genitalia: Pygophore medium brown with dark brown to black pigmentation developed anteriorly; upper pygophore lobes sub-ascending, slightly curved, blinker-like structures, with shallow hooked and flattened termination; claspers with anterior-pointing hooked processes; aedeagus with a pair of dorsal pseudoparameres which bifurcate distally; pseudoparameres join endotheca near to join with gonocoxite IX, and are tapering, acute, and outward pointing apically; apical terminations of endotheca produced into a conspicuous collar-like structure, slightly ornamented.

FEMALE: Colouration and markings as described for male, but with less black pigmentation on head and thorax, but more persistent and extensive black pigmentation on tergites. Head: Postclypeus as in male, but more brown colouration, extending as narrow median fascia on to dorsal surface; gena predominantly

pale brown; dorsal surface of head black with irregular brown anterior and lateral patches. Thorax: Pronotum sandy-brown with only irregular and broken black pigmentation around oblique fissures; mesonotum, legs, and wings as in male. Abdomen: Tergites 2 to 8 reddish-brown each with dorsal to dorsolateral, irregular anterior areas of black pigmentation, concentrated dorsally to dorsolaterally; posterior margins of tergites yellow to yellow-brown; abundant short yellow pubescence; tergite 9 brown with a pair of slightly curved dorsolateral black fasciae extending to near posterior edge of tergite. Sternites II to V orange to yellow-brown, becoming brown on sternites VI and VII. Ovipositor sheath dark brown to black apically, and extending 1-2 mm beyond tergite 9.

MEASUREMENTS: 29♂♂ and 32♀♀. Body length: ♂ 17.3-21.3 (18.98); ♀ 19.8-23.4 (21.06). Fore wing length: ♂ 20.8-23.9 (22.81); ♀ 23.4-25.9 (24.33). Head width: ♂ 5.3-6.2 (5.90); ♀ 5.9-6.7 (6.22). Pronotum width: ♂ 4.6-5.4 (4.96); ♀ 5.1-5.6 (5.29). Abdomen width: ♂ 4.6-5.5 (5.16); ♀ 5.0-5.5 (5.13).

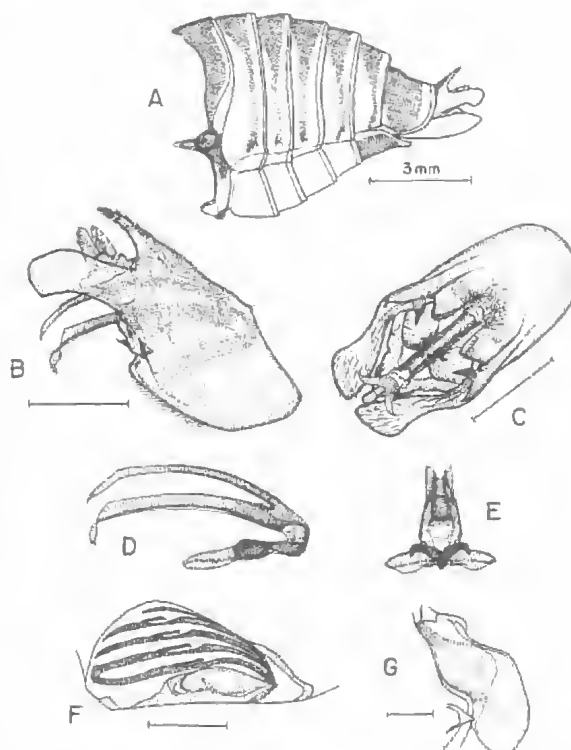


FIG. 36. *Pauropsalta vitellinus* sp.n., ♂, from Cardwell, northern Queensland (JM collection). Symbols A to G, and scales, as in Fig. 2.

COMMENTS

This species is most similar to *P. virgulatus*. The males are distinguished by song (Figs 37,39); length of dorsal tymbal ridge (short, not extending beyond dorsal inter-ridge sclerite in *P. virgulatus*; longer, extending across dorsal inter-ridge sclerite in *P. vitellinus*); and opercula colouration (sandy-brown to yellow-brown in *P. vitellinus*; extensive black to dark brown anterior pigmentation in *P. virgulatus*). The females are distinguished on the basis of ovipositor sheath lengths (extending 1.2 mm beyond tergite 9 in *P. vitellinus*; less than 0.5 mm in *P. virgulatus*). The females may also sometimes resemble *P. marginata*, but ovipositor sheath lengths are a useful distinguishing feature (extending 3.4 mm beyond tergite 9 in *P. marginata*). *P. nigristriga* may also be confused with *P. vitellinus*. The males, however, are readily distinguished by the shapes of their respective upper pygophore lobes (exaggerated 'hook like' form in *P. nigristriga*), while again the relative ovipositor sheath lengths distinguish the females (longer in *P. nigristriga*, extending 2.5-3 mm beyond tergite 9).

DISTRIBUTION

Specimen and aural records indicate a wide distribution through southern central Queensland, northwards to Cardwell and coastal region adjacent to the Paluma Range, and extending westwards to Cloncurry (Fig. 58). This cicada is usually found high up in trees in dry open mixed forest, often bordering swamps and open grassland. Near Cardwell, it occurs on coastal melaleucas and *Eucalyptus alba*, at low to middle heights on trunks. This cicada is locally abundant and records range from November to February.

SONG

This consists of a series of relatively short, sharp, compound phrase groups (here simply referred to as phrases), which are continuously, rapidly, and regularly repeated (Fig. 37). In the field, these phrases tend to be emitted in unison amongst groups of individuals.

Two separate recordings are shown, one from Lake Broadwater (near Dalby), the second (JM) from the coast adjacent to the Paluma Range, northern Queensland. Although, the basic song

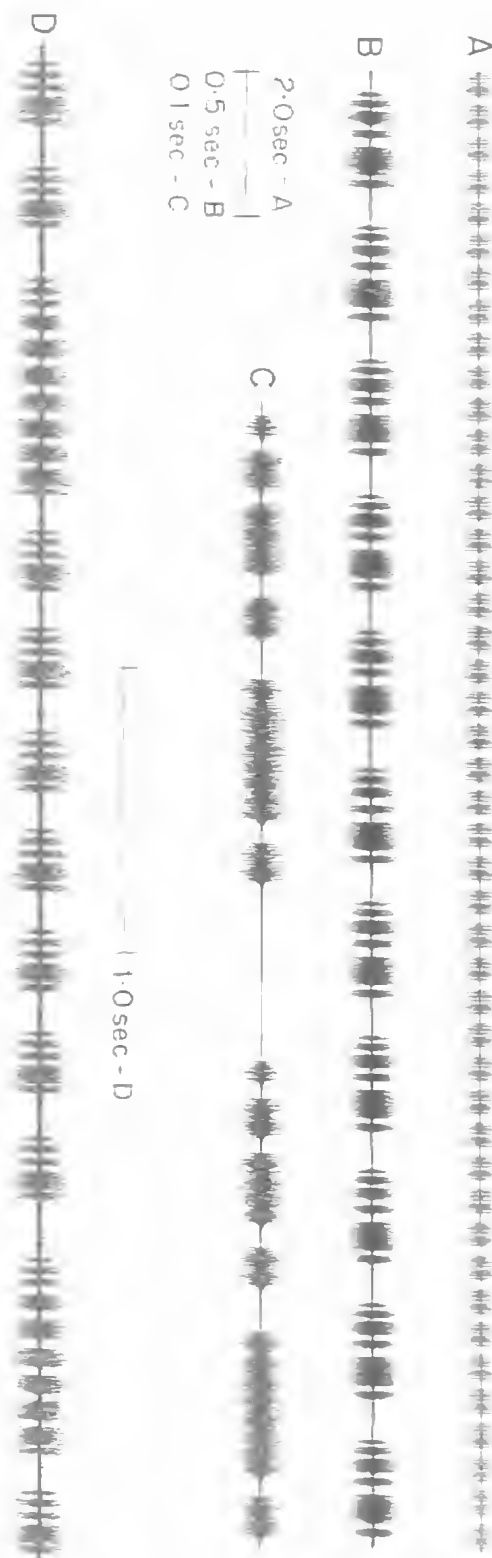


FIG. 37. Oscillograms of calling songs of *P. vitellinus* from: A to C, Lake Broadwater (Feb. 1984); D, coast adjacent to Paluma Range, northern Queensland (JM). Three time scales are shown; note that records B and D have the same scale.

structures are similar, notable differences do occur. The oscillograms show that each phrase consists of a series of discrete subphrases (these strictly representing compound pulse groups); these number from six (Lake Broadwater) to either five or between nine to eleven (Paluma Range), the latter constituting what are here called 'short' (= normal) or 'long' phrases, respectively. An increase in amplitude occurs during the first two or three subphrases, thereafter remaining constant.

Table 3 details the timing of the phrases and subphrases for the two sets of recordings:

Lake Broadwater Song: Examination of the phrases on an expanded time scale (Fig. 37c) suggest a basic compound pulse unit with an average duration of 12.5 msec; each of these units show, within them, a tendency for increasing amplitudes midway through their emission which results in a rough modulation (with frequency of 80 Hz) to each subphrase. Each pulse group unit itself contains at least 10 to 11 separate 'pulses' (each in fact a finer scaled pulse subgroup, not resolvable with the available data); the pulse repetition frequency is estimated to be approximately 890 Hz.

It is evident that the subphrases are made up of multiples, formed by coalescence, of the basic compound pulse units i.e. subphrases 1 to 6 consist of groups of 1, 2, 4, 2, 8, and 2 pulse group units, respectively. The fact that exact numerical correspondences do not occur is evidently due to damping and presumably also resonance effects.

Paluma Range Coast Song: Although this has the same basic structure of the Lake Broadwater song, clear differences are apparent. These consist of the number of subphrases, the occurrence of 'short' and interspersed 'long' phrases, and some subphrase timing differences (although some are closely similar, as shown in Table 3). The 'long' phrases are the result of the repetition of the fourth subphrase in the normal 'short' song (by up to seven times). The final interval and subphrases of the 'short' and 'long' phrases are closely similar. Although the resolution of the Paluma recording is not sufficient to clearly establish the finer pulse structure of the songs, expanded time scale oscillograms (not shown) do suggest very similar compound pulse units to those found in the Lake Broadwater song.

Thus, as with some of the other *Pauiropsalta* species songs, there is geographic variation in song patterns. Clearly, experiments are needed to see whether the Paluma insects recognise the Lake Broadwater call, and *vice versa*.

TABLE 3. Comparative data on calling song patterns of *P. vitellinus*.

	Paluma Range Coast		L. Broadwater
	Short Phrase	Long Phrase	
Length of phrase (sec)	0.21-0.22	0.55-0.76	0.33-0.34
Duration interval between adjacent phrases (sec)	0.12-0.18		0.12-0.14
Details of subphrases and intervening intervals (mean values, msec):			
1st subphrase	15.3	14.0	16.2
1st interval	(16.0)	(16.6)	(9.2)
2nd subphrase	24.8	25.2	28.2
2nd interval	(18.9)	(17.6)	(10.2)
3rd subphrase	25.1	24.6	50.6
3rd interval	(19.2)	(30.0)	(15.6)
4th subphrase	63.4	51.6	29.4
4th interval	(9.0)	(35.2)	(29.1)
5th subphrase	24.0	63.0	99.7
5th interval	—	(33.0)	(17.4)
6th subphrase	—	64.4	29.3
6th interval	—	(29.0)	—
7th to 10th subphrases*	—	62.6-64.0	—
7th to 9th intervals*	—	(21.0-24.0)	—
7th to 9th intervals*	—	(8.6)	—
First interval*	—	24.2	—
Final subphrase*	—	—	—

*long phrase only

***Pauiropsalta virgulatus* n.sp.**
(Figs 38,39,52A,B,58)

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND, Atherton Tableland, nr Mareeba, NQ, Nov-Dec 1982, J.T. Moss (QM, Reg. No. T.11149).

PARATYPES: QUEENSLAND: 4♂♂, Herberton, 26.xii.1949, G.B.; 2♂♂, Herberton, 28.ii.1950, J.C. Brooks; 4♂♂, Herberton, 28.xii.1950, G.B.; 3♂♂, Herberton, 11-17.i.1954, G.B.; 1♀, Herberton, 11-17.i.1954, G. Brooks; 2♂♂, Kuranda, 5.iii.1950, GB; 1♂, 1♀, Kuranda, 28.i.1951, G.B.; 1♂, Kuranda, 3.i.1953, GB; 2♂♂, Mareeba, 2.i.1953, GB. (MV). 1♀, Station Ck, nr Mt Carbine, 4.iii.1981, J.T. Moss (QM). 2♂♂, Blackdown Tableland, Expedition Range, 5-6.xii.1979, M.A. Schneider, G. Daniels, mv lamp; 1♂, Mareeba, 3.i.1941, P.(U.)O'S (UQ1C). 2♂♂, as for holotype; 2♂♂, Clohesy R., Atherton Tableland, 20.iv.1985, J.T. Moss; 3♂♂, 1♀, Fraser Is., i.1978, A. Moss; 4♂♂, 4♀♀, L. Elphinstone, nr Glenden, 20-29.ii.1984, J.T. Moss; 1♂,

Longmans Gap, 12.i.1962, Carne and Britton; 3♂♂, *E. grandis* forest, NW of Paluma, 27-30.i.1981, J.T. Moss; 11♂, 1♀, Station Ck, nr Mt Carbine, 4.iii.1981, J.T. Moss (JM). 1♀, Baldy Mt, Atherton, 15.i.1979, A. and M. Walford-Huggins; 1♂, Davies Ck, Lamb Range, Mareeba Dist., i.1985, S. Lamond; 2♂♂, Expedition Range, Blackdown Tablelands, 1-6.ii.1981, G.B. Monteith; 1♂, Forty Mile Scrub, 65 km SW of Mt Garnet, 10.xi.1981, A. Walford-Huggins; 5♂♂, 2♀♀, Gordonvale, 2.i.1986, S. Lamond; 3♂♂, nr Herberton, 13.i.1977, M.S. and B.J. Moulds; 1♂, 7 km S Herberton, 18.i.1979, R.I. Storey, at light; 1♀, Irvinebank, W of Herberton, 9.i.1983, G. Wood; 2♂♂, Lock Ck, Davies Ck Rd, Lamb Range, Mareeba Dist., 25.xii.1976, M.S. and B.J. Moulds; 2♂♂, 1♀, Lustre Ck between Mt Molloy and Mt Carbine, 20.ii.1975, G. R. Brown; 5♂♂, 1♀, Mareeba, i.1986, S. Lamond; 5♂♂, 4♀♀, nr Mt Fox, SW of Ingham, Edge of rainforest and *Euc. grandis*, 550 m, 3.ii.1986, J. Young, 6♂♂, 4♀♀, 14.ii.1986, 3♂♂, 3♀♀, 15.ii.1986, 5♂♂, 3♀♀, 16.ii.1986, 1♂, 26.xi.1986, 4♂♂, 3♀♀, 4.xii.1986, 4♂♂, 1♀, 6.xii.1986, 9♂♂, 6♀♀, 23.xii.1986; 1♂, 1♀, 36 mi SW of Mt Garnet, 22.i.1977, B.P. Moore; 1♂, 4♀♀, Mt Lewis nr Julatten, i.1986, S. Lamond; 1♂, 5.2 m. W Paluma, 3000', 13.xii.1972, J.G. Brooks; 1♂, 2♀♀, Ravenshoe, i.1986, S. Lamond; 2♂♂, Running R., W of Paluma, 6.i.1986, E.E. and E.W. Adams; 1♂, 2♀♀, Running R. area, 8.5 km W of Paluma, flood gum country, 7.i.1986, E.E. and E.W. Adams; 2♂♂, 20 mi. along Tinaroo Ck Rd nr Mareeba, at M.V.L., 30.xii.1972, M.S. and B.J. Moulds; 1♀, Tinaroo Ck Rd nr Mareeba, 21.i.1982, G. and A. Daniels, rainforest edge; 1♂, 1♀, Tinaroo Dam, nr Atherton, 22.xii.1981, J. Olive; 1♂, Tinaroo Dam wall nr Atherton, 22.ii.1982, M.S. and B.J. Moulds; 5♂♂, 2♀♀, Tinaroo Lakes, 22.xii.1981, J. Olive (MSM). 1♀, Gordonvale, 2.i.1986, S. Lamond; 2♂♂, nr Mt Fox, SW of Ingham, Edge of rainforest and *Euc. grandis*, 550 m, 3.ii.1986, J. Young, 1♀, 14.ii.1986, 1♀, 15.ii.1986, 1♂, 16.ii.1986; 1♂, Ravenshoe, i.1986, S. Lamond; 1♀, Mareeba, i.1986, S. Lamond (AE).

ETYMOLOGY

Derived from *Latin virgulatus*, meaning striped.

DESCRIPTION

MALE: Head: Predominantly black. Postclypeus shiny black anteriorly with pale sandy-brown margin and elliptical pale spot dorsally on midline; dorsal surface black; short silver yellow pubescence. Anteclypeus shiny black with silver-yellow pubescence. Rostrum medium brown, becoming darker apically, and extending to mid coxae. Gena and mandibular plate black with pale brown intervening ridge (enlarged adjacent to postclypeus) and marginal ridges; conspicuous silvery-yellow pubescence. Antennae deep brown. Vertex lobes dark reddish-brown. Ocelli pink. Eyes dark brown. Dorsal surface of head black with pallid triangular depressed area located

posteriorly on longitudinal suture between ocelli; yellow-brown pubescence especially conspicuous behind eyes.

Thorax: Pronotum black with a conspicuous pale sandy-brown central fascia, not quite extending to pronotal collar; pronotal collar and anterior margin pale brown; short yellowish pubescence.

Mesonotum dominantly black with a pair of narrow, somewhat indistinct, curved dorsolateral medium brown bands extending longitudinally to anterior arms of cruciform elevation; wing grooves pale brown; cruciform elevation pale brown, black between arms; sparse yellowish pubescence, most conspicuous around cruciform elevation.

Legs: Coxae dominantly black to deep brown, but tending paler along posterior margins; femora dark brown anteriorly, pale brown along posterior margins, the hind femora being generally paler; tibiae and tarsi pale sandy brown; claws and spines dark brown.

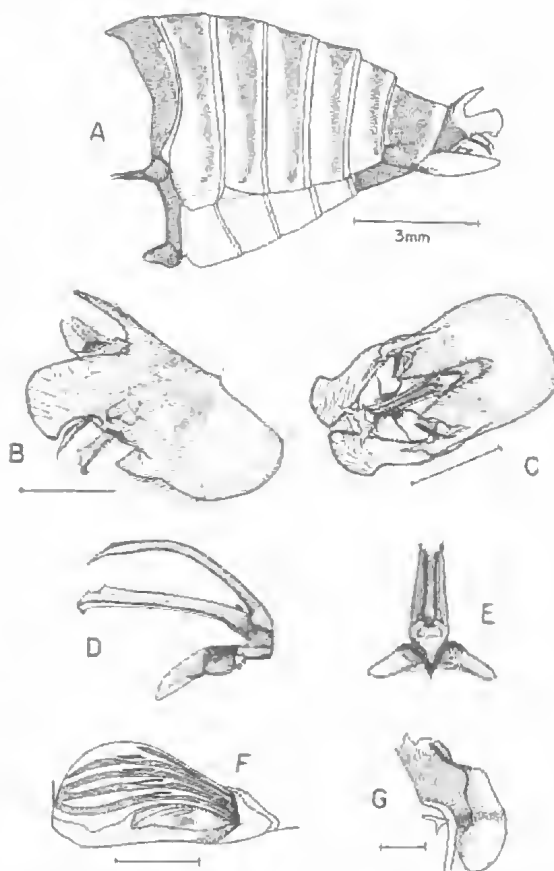


FIG. 38. *Pauropsalta virgulatus* sp.n., ♂, from Atherton Tableland, near Mareeba, northern Queensland (JM collection). Symbols A to G, and scales, as in Fig. 2.

Wings: Costal veins of fore wing pale brown, remaining venation dark brown, becoming darker along ambient vein; infuscation along vein IA + 2A on fore wings faint; infuscation spots on hind wings distinct.

Tymbals: Dorsal ridge short, not extending across dorsal inter-ridge sclerite; lower three ridges normally joined anteriorly.

Opercula: Broadly sickle-shaped, longitudinally undulate (i.e. parallel to body axis), with asymmetrically rounded inward (posterior) termination; no clear domed structure; anteriorly black to dark brown, becoming pale sandy-brown around posterior margin; declivous marginal flange most noticeable along outer margin; surface finely rugose.

Abdomen: Tergite 2 black with narrow brown and yellow-brown zone adjacent to posterior margin; tergites 3 to 7 yellow-brown to orange-brown with well defined black bands running around each tergite, each band broadest dorsally and narrowing and terminating towards lower edge; tergite 8 mostly black with narrow anterior and posterior pale brown margins; posterior margins to tergites orange-brown. Sternite II black; sternites III to VI orange-brown; sternite VII mostly black; sternite VIII pale brown with small anterior median black area.

Genitalia: Pygophore black anteriorly, otherwise pale brown; upper lobes form broad blinker-like structures with broadly curved and hooked terminations; inner lobes raised and acutely tapering; claspers with hooked terminations; dorsal pseudoparameres approximately same length as endotheca, and bifurcate distally; endotheca slightly curved with pointed, tripartite and hooked terminations.

FEMALE: Markings and colouration similar to male, with reduction in extent of black pigmentation on mesonotum and abdomen. Pronotum: Pale brown triangular area extending from posterior edge of central fascia along dorsolateral edge of pronotal collar. Mesonotum with broader, irregular pale brown dorsolateral fasciae, and additional pale brown lateral oblique fasciae, the two pairs of fasciae coalescing adjacent to anterior arms of the cruciform elevation; the dorsolateral fasciae also broaden laterally, resulting in a distinct black area anteriorly to cruciform elevation. Abdomen: Tergites 2 to 7 with distinct dorsal black bands, which terminate dorsolaterally; on tergite 8, the black band extends from dorsally to lower edge; tergite 9 with a pair of dorsolateral longitudinal black fasciae which coalesce near posterior margin

of tergite; remaining colouration of all tergites pale brown to orange-brown with posterior margins yellow brown. Sternites orange to orange-brown; ovipositor sheath extends only just beyond (< 0.5 mm) tergite 9.

MEASUREMENTS: 40♂♂ and 8♀♀. Body length: ♂ 14.0-18.8 (16.77); ♀ 16.0-18.3 (17.65). Fore wing length: ♂ 17.0-22.4 (20.71); ♀ 20.3-22.4 (21.25). Head width: ♂ 4.7-5.8 (5.29); ♀ 5.1-5.6 (5.41). Pronotum width: ♂ 4.0-4.8 (4.35); ♀ 4.3-4.6 (4.40). Abdomen width: ♂ 4.0-5.1 (4.72); ♀ 4.3-4.8 (4.55).

COMMENTS

As noted in the description of *P. vitellinus*, these two species are similar, and reference should be made to the latter species for distinguishing features.

DISTRIBUTION

Most records are from the Atherton Tableland region south to near Mt Garnet and north to near Mt Carbine (Fig. 58). Southerly records extend through the Paluma Range, the Blackdown Tableland, and near Glenden, to as far south as Fraser Island. Preferred habitat is open dry forest where the cicada tends to occur relatively low down. It is recorded from November to April.

SONG

Two sets of recordings are available (JM) — one from near Mt Carbine and a second from the Paluma Range (Fig. 39). As with previous songs, these two songs also exhibit differences although showing the same basic song patterns.

The song consists of a regularly repeated compound phrase group, comprising a set of initial short subphrases, followed by a longer subphrase, this showing increasing (although somewhat variable) amplitude towards the end of the subphrase. A major difference between the songs is the number of short subphrases emitted, varying from two pairs of two (Mt Carbine) to four, or less often five, pairs of two (Paluma Range); the interval between the emission of successive pairs tends to decrease during the emission of each phrase group. Table 4 summarise timing details measured for the two song patterns.

Expanded time scale oscillograms do not give clear high resolution information for either song pattern, but are sufficient to indicate that the phrases comprise compound pulse groups, of 4-6 msec duration, which coalesce into clusters of two, three, or four sets of pulse groups.

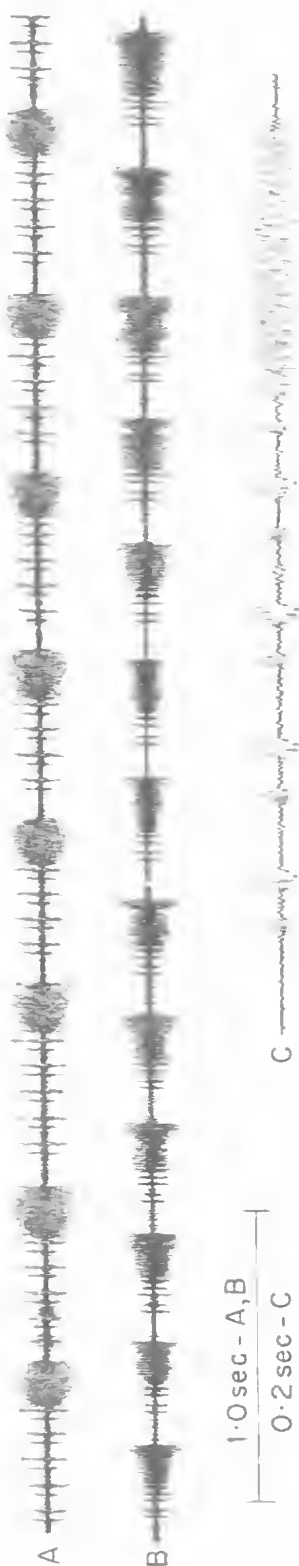


FIG. 39. Oscillograms of calling songs of *P. virgatus* from: A, C, Paluma Range, northern Queensland (JM); B, Mt Carbine, northern Queensland (JM). Two time scales are used, with A and B having the same scale.

TABLE 4. Comparative data on calling song patterns of *P. virgatus*.

	Mt Carbine	Paluma Range
Duration of short subphrases (msec)	6.8 (less often 16)	8-10 (first pair) 12-14 (second pair)
Duration of long subphrases (sec)	0.16-0.22	0.16-0.18
Intervals between short subphrases (msec)		
(a) between subphrases of same pair	10-15	17-20
(b) between adjacent pairs	25-35	32-48
Intervals between phrase group (sec)	0.10-0.15	0.10-0.14

***Pauropsalta nigristriga* Goding and Froggatt
(Figs 8E,F,40,41,58)**

Pauropsalta nigristriga Goding and Froggatt, 1904:619,620; Distant, 1906b:179; Moulds, 1987:17,18, figs 1,3,4.

MATERIAL EXAMINED

HOLOTYPE: ♂ of *Pauropsalta nigristriga*, in ANIC: Endeavour R., also bearing red type label, ex MM, and 'on permanent loan' to ANIC.

OTHER MATERIAL: 21♂♂, 9♀♀ from following localities. QUEENSLAND: Hambleton; Kuranda; Mareeba, Mowbray R. (MV). Ellis Beach; 15.10S 145.07E, 3.5 km SW by S of Mt Baird, nr Cooktown; Station Ck, nr Mt Carbine (JM). Annan R. crossing, Grass Tree Pocket Road; Cairns; Clohesy R. crossing, Mareeba-Kuranda Road; Davies Ck crossing, Mareeba Road; 15 mi. along Gunawarra Rd, via Mt Garnet; Laura R., at old homestead; Mt Molloy; 10 km S of Mt Molloy; 10 km S of Woodstock, S of Townsville; York Downs, 50 km E of Weipa (MSM).

DESCRIPTION

MALE: Head: Postclypeus shiny black anteriorly with broad pale sandy-brown margin, extending between transverse ridges; conspicuous pallid area dorsally on midline; dorsal surface with median thin pallid fascia extending from midline to median ocellus; fine silvery pubescence especially along transverse ridge. Anteclypeus shiny black with conspicuous silvery pubescence. Rostrum pale brown becoming darker apically; just extends to hind coxae. Gena and mandibular plate black with intervening and marginal ridges pallid; conspicuous silver pubescence. Antennae medium brown. Vertex lobes pale sandy brown. Ocelli pink. Eyes dark brown. Dorsal surface of head with pallid triangular area situated on longitudinal

suture between ocelli, and small dorsolateral posterior pallid area adjacent to eyes; silvery pubescence conspicuous behind eyes.

Thorax: Pronotum black with pale sandy-brown anterior margin, pronotal collar, broad central fascia, and median to dorsolateral area extending from posterior end of central fascia to pronotal collar; short silvery pubescence.

Mesonotum black with dorsolateral pale sandy-brown fasciae, widening medially, and a pair of pale sandy-brown oblique, broad, lateral fasciae; both sets of fasciae coalesce near anterior arms of cruciform elevation; cruciform elevation pallid, black anteriorly; wing grooves and adjacent ridges pallid; silvery pubescence especially along wing grooves and around cruciform elevation.

Legs: Coxae deep brown to black with pale sandy-brown outer margins; fore femora dark

brown anteriorly, with alternating pale and medium brown areas; mid and hind femora with alternating dark and pale brown longitudinal fasciae, tending darker anteriorly; fore tibiae medium brown; mid and hind tibiae pale sandy-brown; tarsi pale brown; claws and spines dark brown.

Wings: Venation dark brown, except pale brown costal veins of fore wings; infuscation spots on hind wings weak.

Tymbals: Dorsal ridge does not fully extend across dorsal inter-ridge sclerite; lower two ridges joined anteriorly; distinct basal spur.

Opercula: Broadly sickle-shaped, undulate, with anterior domed region; broad, rounded inward (posterior) termination; marginal declivous flange, best developed along outer margin; colour dominantly very pale sandy-brown, except for relatively small deep brown anterior area; surface finely rugose.

Abdomen: Tergite 2 black antero-dorsally, and laterally, otherwise orange-brown; tergite 3 to 7 orange-brown, with black dorsal to dorsolateral bands; tergite 8 dominantly black except for irregular orange-brown posterior margin; posterior margins of tergites orange-brown. Sternite II mostly black with smaller pale brown lateral margins; sternites III to VI, and intervening posterior margins of sternites orange-brown; sternite VII mostly black with antero-lateral pale brown area, in some specimens also paler along posterior margin; sternite VIII pale to medium brown, darker anteriorly.

Genitalia: Pygophore dark brown to black anteriorly, otherwise pale sandy-brown; upper lobes well developed into ascending and strongly curved 'hook-like' form (as seen laterally); inner and lower lobes distinct; claspers hooked; a pair of dorsal curved pseudoparameres, longer than endotheca, which bifurcate and join endotheca near gonocoxite IX.

FEMALE: Colouration and markings similar to male, with some decrease in extent of black pigmentation. Dorsal surface of postclypeus has broad median pallid area, and pallid patches on dorsal surface of head enlarged. Fore and mid legs are more extremely coloured with medium and pale brown longitudinal fasciae. Tergites and posterior margins of tergites are dominantly orange-brown to pale brown, with broken brown patches on tergite 2; the dorsal darker areas on tergite 3 to 7 are medium to dark brown, and less clearly defined than in male; tergite 8 pale sandy brown, with dark brown narrow anterior margin dorsally and dorsolaterally; tergite 9 pale brown

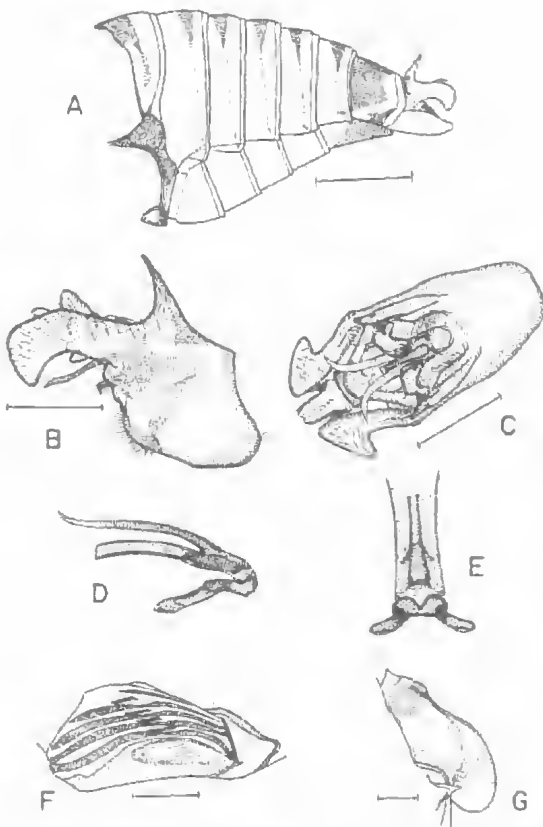


FIG. 40. *Pauropsalta nigristriga* Goding and Froggatt, ♂, from Station Ck, near Mt Carbine, northern Queensland (JM collection). Symbols A to G, and scales, as in Fig. 2.

with pair of darker longitudinal, dorsolateral broad fasciae, broadened anteriorly, but not reaching posterior margin; an additional pair of dark brown postero-lateral spots. Sternites pale brown to orange-brown with pale brown, median, triangular-shaped areas on sternites III to VII; ovipositor sheath extends 2.5-3 mm beyond tergite 9.

MEASUREMENTS: 21♂♂ and 8♀♀. Body length: ♂ 17.0-20.6 (19.14); ♀ 20.5-23.9 (22.17). Fore wing length: ♂ 22.0-24.9 (23.68); ♀ 22.0-25.4 (23.88). Head width: ♂ 5.1-5.8 (5.52); ♀ 5.3-5.8 (5.60). Pronotum width: ♂ 5.0-5.5 (5.21); ♀ 5.0-5.4 (5.27). Abdomen width: ♂ 5.6-6.4 (6.00); ♀ 5.3-5.8 (5.59).

COMMENTS

This species was synonymized by Ashton (1914:355) with *P. melanopygia* (Germar). This action was followed by subsequent workers until Moulds (1987) removed it from synonymy. This species is similar to *P. infrasila* and *P. opacus*; the main distinguishing features of *P. nigristriga* are the strongly angulated (or 'hooked') upper pygophore lobes (male) and the relatively long female ovipositor sheath extending 2.5-3.0 mm beyond tergite 9. The same features enable *P. vitellinus* and *P. virulatus* (with less angulated pygophore lobes and shorter ovipositors) to be easily distinguished from *P. nigristriga*.

DISTRIBUTION

Restricted to northeastern Queensland, mainly along the eastern side of the dividing ranges, from near Laura southwards to Woodstock, south of Townsville (Fig. 58). A single record exists from York Downs, near Weipa. Habitat preference is for open forest. The cicada occurs between December to March.

SONG

Based on a recording from near Mt Carbine (JM), the song consists of regularly repeated phrases, each showing an initial amplitude rise, thereafter remaining roughly constant, although there is a weak indication of some modulation; each phrase ends abruptly (Fig. 41). Phrase lengths vary between 1.2-1.4 secs, the corresponding inter-phrase intervals being 0.22-0.31 sec.

The pulse structure constituting the phrases has a bimodal amplitude distribution, with regularly alternating high and low amplitude pulses, the latter being asymmetric, possibly resulting from the coalescence of three smaller pulses, each with progressively increasing amplitude. The pulse repetition frequency of each of the high and low amplitude pulses is estimated to be 115-120 Hz.

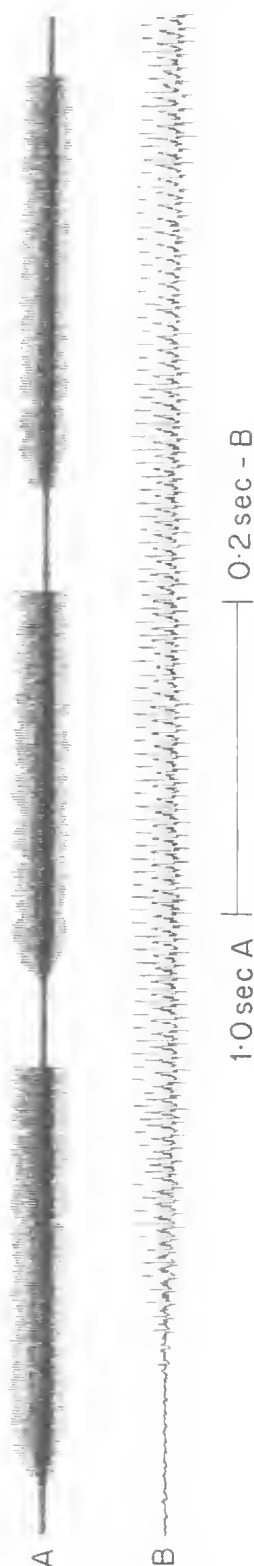


FIG. 41. Oscillograms of calling song of *P. nigristriga* from near Mt Carbine (JM). The song is shown on two time scales.

P. ANNULATA SPECIES-GROUP

Four species are recognised in this group but only three are described here. The fourth, *P. rubristrigata* (Goding and Froggatt), occurs from the Australian Capital Territory through to South Australia (Moulds, in press). These are small to medium sized cicadas (11–25 mm body length) with the usual preference for open forest habitats, and in Queensland, most commonly occurring in outer foliage, although *P. ayrensis* also occurs in shrubs and grass. The Queensland species are most common along the coastal region east of the Dividing Range, but *P. eyrei* extends into northwestern Queensland; *P. annulata*, although a southeastern Queensland insect, also has some apparently isolated inland populations, notably within the Blackdown and Carnarvon Tablelands. Both *P. annulata* and *P. ayrensis* — being relatively small, blackish species — have previously been loosely grouped under the name *P. encrustica* (e.g. Burns, 1957; Moulds, in press), as with many of the smaller cicadas within the *P. marginata* group.

***Paurosalta annulata* Goding and Froggatt**
(Figs 42, 43, 44, 45A, B, 59)

Paurosalta annulata Goding and Froggatt, 1904:620, 621; Metcalf, 1963:405; Ewart, 1986:51; Ewart, 1988:181, fig. 9A, Pl. 4C.

MATERIAL EXAMINED

LECTOTYPE: ♂ of *Paurosalta annulata* here designated, in ANIC: Southport, Queensland, 16.x.1901, W.W. Froggatt; ex MM and 'on permanent loan' to ANIC.

OTHER MATERIAL: 350 specimens from following localities. QUEENSLAND: Comet; Millmerran (ANIC); Birkdale, Brisbane; Brisbane; National Park; Ormiston (QM); Brisbane, Coolumb (MV); Blackdown Tableland; Brookfield, Brisbane; Caloundra; Cania Gorge, 26 km NW of Monto; Carnarvon Gorge; Goomeri; Gympie; Hervey Bay; 24 mi. SW by W of Kingaroy; Nambour; Pt Vernon, Hervey Bay; Rochdale, Brisbane; Urangan, Hervey Bay; Wallaville; Waruma Dam, nr Eidsvold; Yaamba, N of Rockhampton (JM); Armstrong Ck, Dayboro; Burnett R. crossing, N of Eidsvold; 28 km W of Condamine; 40 km WNW Goondiwindi; Kimbombi Falls, Goomeri; 116 km S of Mitchell; Mt Moon, nr Boonah; Toowoomba, scrub below escarpment; Willicott, c. 8 km NE Toowoomba (MSM); Blackdown Tableland; Burnett Ck, nr Mt Maroon; Carnarvon Gorge; Charlevue Ck causeway, c. 10 km from Horseshoe Lkt., base of Blackdown Tableland; Chelmer, Indooroopilly and St Lucia, Brisbane; Crows Nest; Doonlandella, SW Brisbane; Kenmore, Brisbane; Lake Broadwater, c. 30 km SW Dalby; McFarlane Bridge,

Brisbane valley; Moggill and Brookfield, W Brisbane; Moogoorah Dam; Mt Coolumb; slopes of Mt Lindsay; Mt Lindsay, N of farm property; 'Rockwood' property, Chinchilla; Somerset Dam; Samford, N Brisbane; Tarragindi, Brisbane; Upper Samford valley, N Brisbane; Waddy Pt, Fraser Is.; Wishart, Brisbane (AE). NEW SOUTH WALES: Camden; Tubrabulla (MV). Compo West, nr Sydney; Glenbrook; Kempsey; Kirrawee, nr Sutherland; Riverstone; South West Rocks (JM). Avoca Beach; Failford, nr Taree; Forster; Goolgowie; 11 km S of Kempsey; Kew; Kempsey; Kincumber; Kyogle; Lane Cove, Sydney; 'Old Bar Park', Old Bar, E of Taree; Port Macquarie; Upper Eden Ck, nr Kyogle; Waitara, Sydney; Wallis L.; Wangaree S.F.; cent. W sect. Yarratt S.F. NE Wingham (MSM).

DESCRIPTION

MALE: *Head*: Postclypeus shiny black anteriorly, with narrow pinkish-brown margin, and yellow-brown dorsal spot on midline extending on to dorsal surface; short silver pubescence; dorsal surface mainly black with yellow pubescence. Anteclypeus shiny black with conspicuous silver pubescence. Rostrum pallid proximally and deep brown to black apically, with silver pubescence; extends to mid coxae. Mandibular plate black with an outer narrow pale brown marginal ridge, extending to suture between gena; conspicuous silver pubescence. Gena black with conspicuous silver pubescence. Antennae deep brown to black. Ocelli pink-red. Eyes red in live specimens, darkening to reddish-brown or brown in dried specimens (with rare live specimens having white eyes); deep furrow between eyes and pronotum. Dorsal surface of head black with a small, pallid, triangular depressed area between ocelli, anteriorly pointing, and extending to the posterior margin of head; short yellow pubescence, becoming silvery-yellow and more conspicuous behind eyes. Vertex lobes black.

Thorax: Pronotum black; narrow pale brown central fascia, spindle-shaped, not extending to posterior or anterior margins; silvery-yellow pubescence, especially along oblique fissures; pronotal collar brown to reddish-brown, pallid laterally.

Mesonotum mostly black with dark brown dorsolateral, narrow triangular areas, apices inward facing; cruciform elevation brown to pink-brown, black anteriorly; ridges between wing grooves pallid; silver-yellow pubescence, especially conspicuous around cruciform elevation.

Legs: Coxae black with longitudinal pallid fasciae along fore coxae; fore femora pink with broad, dark brown longitudinal fasciae; mid and hind femora deep brown, becoming pallid distally; fore and mid tibiae dark brown, pallid dorsally;

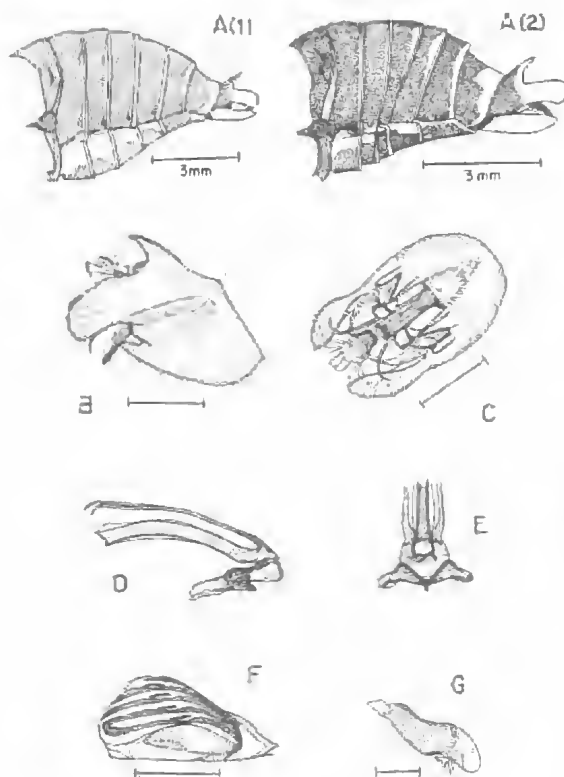


FIG. 42. *Pauropsalta annulata* Goding and Froggatt, ♂♂; A1: Abdomen of specimen from Indooroopilly, Brisbane, viewed from left laterally. A2: Abdomen from lectotype from Southport (ANIC), viewed from left laterally. B to G based on Brisbane specimen. Symbols B to G, and scales, as in Fig. 2.

hind tibiae pallid; tarsi and claws pale brown, being more pallid on hind legs; spines dark brown.

Wings: Fore wing venation pale reddish-brown to brown, becoming darker towards apical cells and ambient veins; fore wing costal veins pale brown; slight angulation of fore wings at node; pterostigma pale reddish-brown; hind wing infuscation spots distinct.

Tymbals: Dorsal ridge extends across dorsal inter-ridge sclerite; two lower ridges joined anteriorly; small but distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated; central region somewhat domed, shiny black; posterior outer region pallid and surface slightly rugose; declivous flange along outer margin; posterior margin rounded; roughly longitudinally undulate i.e. parallel to body axis.

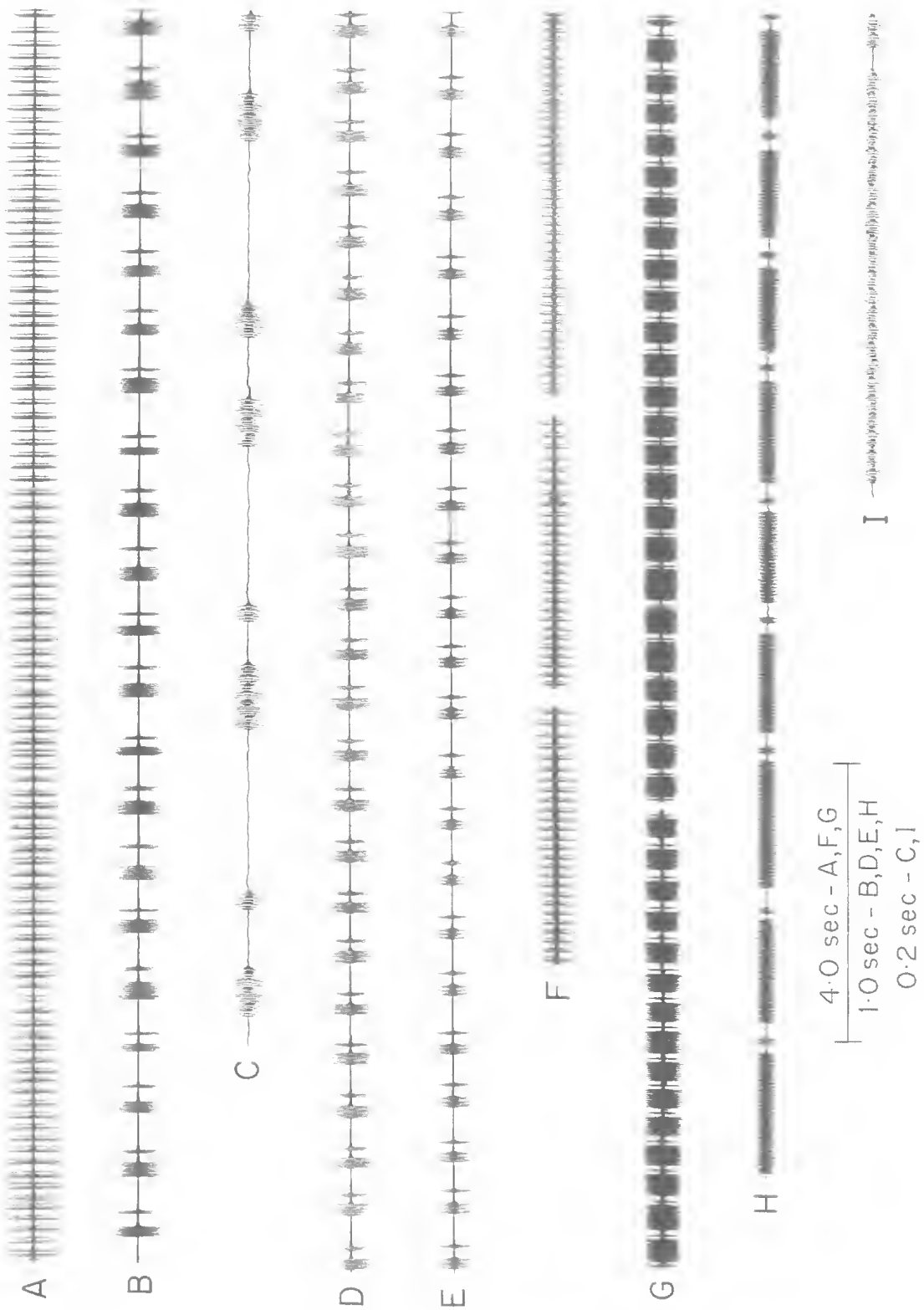
Abdomen: Tergites mainly black with conspicuous yellow to yellow-brown posterior tergite margins between tergites 3 to 7; narrow pale

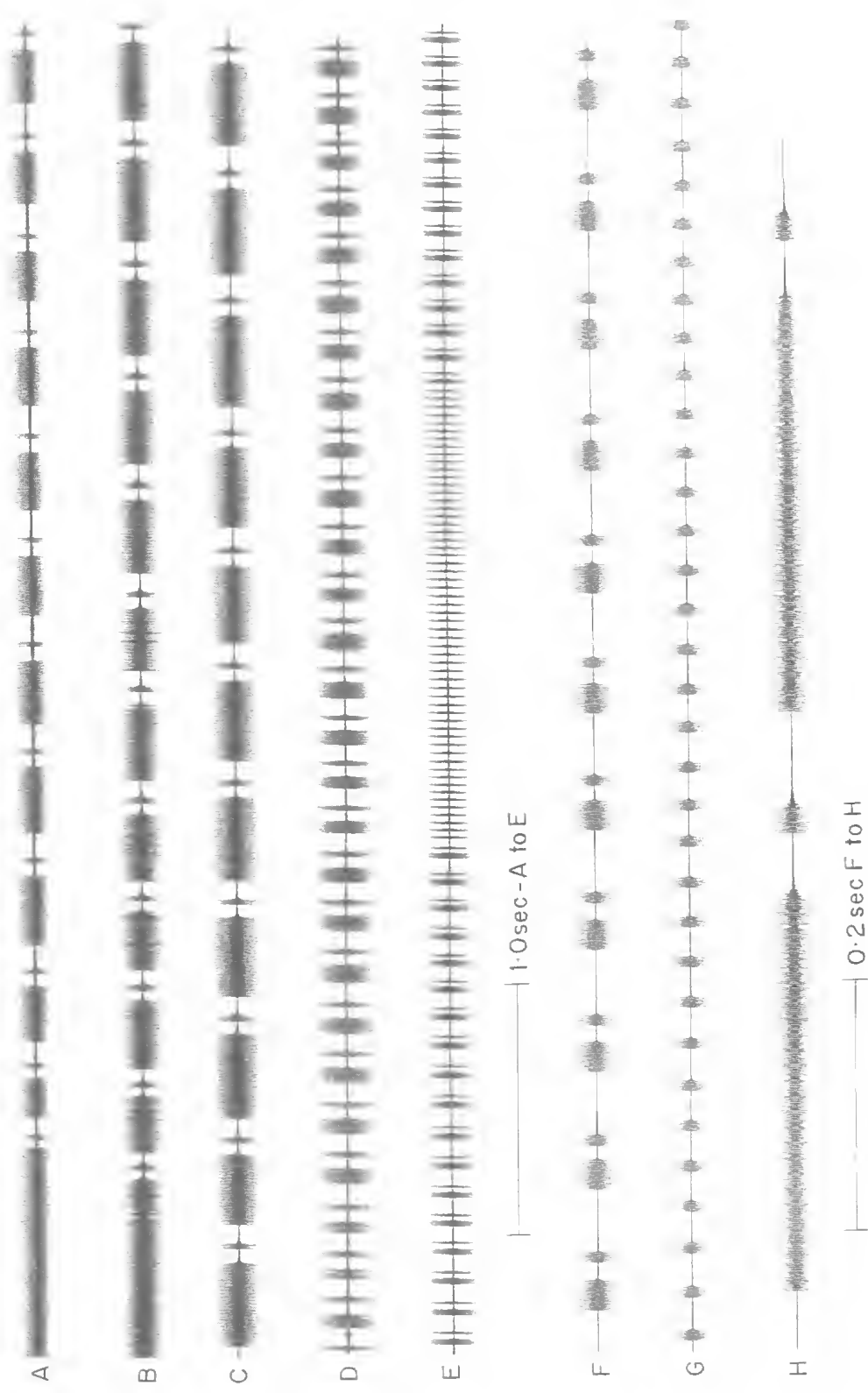
brown zones extending dorsolaterally to lower edges of tergites adjacent to posterior margins of tergites 2 to 7 (very narrow on 2); broad, diffusc, dark brown zone extends around posterior half of tergite 8; silver-yellow short pubescence, especially noticeable laterally, and extending dorsolaterally on tergites 2 and 8. Sternite II mainly black; sternites III to VI yellow-brown with broad, black median areas, becoming more extensive towards sternite VI; sternite VII black, becoming brown posteriorly; posterior margins to sternites yellow-brown, slightly darker medially; sternite VIII medium brown with narrow irregular black anterior region; short silver pubescence, especially noticeable laterally.

Genitalia: Pygophore black anteriorly, brown posteriorly; upper lobes form blinker-like structures, erect, terminally rounded; lower lobes distinct, bulbous; inner lobes enlarged, acute, posteriorly tapering; claspers contain a pair of hooked processes; aedeagus with dorsal pseudoparameres, which bifurcate and join endotheca near gonocoxite IX; pseudoparameres apically curved, tapering; endotheca slightly curved, sclerotised, weakly ornamented apically.

FEMALE: Similar colouration and patterning to male, being generally paler due to less extensive black pigmentation. Head colouration similar to male, except for yellow-brown vertex lobes. Pronotum: Central fascia broader, and extending to anterior margin, the latter brown to yellow-brown; pronotal collar brown to yellow-brown, this colouration extending dorsolaterally either side of central fascia to form a pair of outward-pointing, wedge-shaped patterns. Mesonotum: Black with brown to yellow-brown median, dorsolateral, and lateral fasciae, each wider than in male, resulting in a greater extent of dorsolateral and lateral brown to yellow-brown colouration. Legs similar to male, with tarsi somewhat paler. Abdomen: Tergites similar to male; tergite 9 sandy-brown with a pair of longitudinal near-dorsal black fasciae which extend to, and laterally down the anterior edge; sternites sandy-brown with a broad and more or less regular median black fascia from sternites II to VII; ovipositor sheath

FIG. 43. Oscillograms of calling songs of *P. annulata* from: A to C, Indooroopilly, Brisbane (Feb. 1978); D, E, Mt Coolum, southern Queensland (Oct. 1981; D is red-eyed type; E, white-eyed type); F, Hervey Bay (JM); G to I, Upper Samford valley, northern Brisbane. A to F represent the normal song pattern; G to I represent the extended song pattern. Three time scales are shown.





extends approximately 0.5-1 mm beyond termination of tergite 9.

MEASUREMENTS: 54♂♂ and 22♀♀. Body length: ♂ 11.2-15.2 (13.40); ♀ 12.4-16.0 (14.36). Fore wing length: ♂ 14.0-17.8 (15.69); ♀ 15.2-18.3 (16.95). Head width: ♂ 3.8-4.8 (4.41); ♀ 4.1-5.1 (4.64). Pronotum width: ♂ 3.0-4.0 (3.57); ♀ 3.3-4.1 (3.71). Abdomen width: ♂ 3.6-4.4 (3.95); ♀ 3.3-4.3 (3.89).

COMMENTS

Two male syntypes of *Pauropsalta annulata* are held in ANIC. One is labelled 'Southport' and is selected as lectotype. The second specimen is from Townsville (December, 1902, F.P. Dodd) but, with damage to the genitalia and some mould coverage, is not as well preserved as the Southport specimen. The two syntypes are not conspecific: the Townsville specimen is *P. ayrensis*. In the original description of *Pauropsalta annulata*, Goding and Froggatt, 1904, refer to six additional syntypes (in MM). The additional localities were Gatton and Gin Gin (Queensland); Narromine and Wagga (New South Wales).

Pauropsalta annulata was synonymised by Distant (1906b:178) with *Pauropsalta encaustica*, a synonymy rejected by Metcalf (1963:405), but not by Duffels and van der Laan (1985:300).

This species can be distinguished from *P. corticinus*, *P. fuscata* and *P. siccanus* by the more strongly banded abdomen, the very pale, ascending, and non-hooked upper pygophore lobes (male), and the red eyes in fresh specimens (with relatively rare exceptions). Females may also be distinguished by the paler coloured tergite 9, and the relative length of the ovipositor sheath (extending <0.5 mm beyond tergite 9 in *P. corticinus*, *P. fuscata* and *P. siccanus*; >0.5 mm in *P. annulata*). *P. annulata*, however, is closest to *P. ayrensis*, and both species extensively overlap in range, although differing in their songs and habitat preferences. The males can usually be distinguished by colouration of the tergite margins

(yellow to yellow-brown in *P. annulata*; orange to orange-brown in *P. ayrensis*); shape of pygophore upper lobe (broad, rounded termination in *P. annulata*; slightly hooked termination in *P. ayrensis*); colour of eyes in fresh specimens (normally red in *P. annulata*; dark reddish-brown to black-brown in *P. ayrensis*); and shape of endotheca (Figs 42D, 46D), this being the most diagnostic character (broadened apically, i.e. 'trumpet-like' in *P. ayrensis*; curved and cylindrical in *P. annulata*). Females differ in colouration of tergite margins and eyes (as above), and relative ovipositor sheath lengths (extending 0.5-1 mm beyond tergite 9 in *P. annulata*; not extending significantly beyond tergite 9 in *P. ayrensis*).

DISTRIBUTION

Widely distributed along eastern New South Wales from Sydney north to the Rockhampton area, central Queensland (Fig. 59). It is common on the Carnarvon Gorge and Tableland, and on the Blackdown Tableland. Aural records suggest that it extends inland to the Warrumbungles and Narrabri regions of central northern New South Wales. In Queensland, it occurs commonly in open dry sclerophyll forest, including suburban parks and gardens. It also occurs on the coastal fringe in casuarinas and melaleucas (see also Goding and Froggatt, 1904: 620-621), especially where these extend inland to open forest communities. Records occur between September to March.

SONG

Extensive variation of the calling song of *P. annulata* has been observed and illustrates the problem of using song as a diagnostic taxonomic character; it also raises the question (in the absence of direct experimental data) of the acoustic characteristics by which this cicada can recognise its own song patterns.

The common southeastern Queensland song consists of a series of alternating 'long' and 'short' phrases (each associated pair of phrases being here called a phrase group), which are continually and monotonously repeated. Two main song variants are recognised, based on the relative duration of the 'long' phrase; this can either be relatively short (i.e. 33-70 msec; referred to here as normal song), or relatively long (150-450 msec; referred to here as extended song). Each phrase group is defined as a 'long' phrase plus the following short phrase, the latter always <30 msec. Details of the phrase lengths, and intervening durations, are listed in

FIG. 44. Oscillograms of calling songs of *P. annulata* from: A, Kirrawee, Sydney (JM); B, C, H, Carnarvon Lodge, entrance to Carnarvon National Park (Dec. 1985; songs from two separate specimens); D, Blackdown Tableland (Dec. 1985); E to G, northern base of Blackdown Tableland (Charlevue Ck; F represents the extended time scale of the 'chirping' song phase, while G represents the extended time scale of the 'buzzing' song phase). Records shown at two time scales. A to C, and H represent extended song pattern; D to G represent normal song pattern.

Table 5, this being based on detailed oscillogram measurements of ten separate sets of calling songs. It is evident that even apart from the two major song variants, variations in the frequency of phrases and interphrase intervals occur, both within and between individual insects (noting also that each song was taped with captured insects recorded under comparable conditions of lighting and temperature). A further variation in the calling songs is the apparently random occurrence of a very long, continuous phrase, occasionally interspersed with the more normal song patterns; this is illustrated (in part) in the initial parts of the oscillogram shown in Figure 44A,B, and can occur in either the normal or extended songs.

The unresolved difficulty of the two major song variants is their distinctive regional occurrence. For example, the normal song is that most commonly heard throughout southeastern Queensland (eg. Fig. 43A-F); in two local areas around Brisbane, however, the extended song

seems to strongly predominate, one being Brookfield (W. Brisbane), the second being the upper Samford valley, extending to Mts Nebo and Glorious (N and NW of Brisbane; see Fig. 43G-I). The Sydney region is also characterised by the extended song (Fig. 44A; JM, pers. comm.). In the lower Carnarvon Gorge, the extended song is typical (Fig. 44B,C), whereas on the associated tablelands, the normal song is heard. On Blackdown Tableland, only the normal song is encountered (Fig. 44D). No significant morphological differences have been found in specimens representing these various 'song' populations. Moreover, on occasions in Brisbane, the extended song has been heard emitted by individuals otherwise singing the normal calling song. Thus, there is currently no compelling evidence to support the existence of two sibling species, and thus *P. annulata* is treated as a single species.

Expanded time scale oscillograms enable the

TABLE 5. Comparative data on calling song patterns of *P. annulata*.

	Brisbane		Mt Coolum		North Brisbane	Sydney	Carnarvon Gorge	Blackdown Tableland	Base of Blackdown Tableland
	Indoor-oopilly 16.ii.1978	Chelmer 20.xi.1980	White-eyed variety 17.x.1981	Normal red-eyed type 17.x.1981	Upper Samford Valley 1.xi.1979	Kirrawee	11.xii.1989	17.xii.1985	17.xii.1985
1. Duration of long phase (msec)	33-39 (38) [rarely 48]	40-46 (49)	45-63 (49)	41-50 (48)	290-450 (340)	150-280 (225)	230-310* (276) 310-370* (325)	40-70 (61)	24-25 (24)
2. Duration of short phase (msec)	12-17 (14) [rarely 25-26]	12-19 (15)	16-20 (18)	16-19 (17)	25-30 (27)	20-22 (21.5)	20-25 (23)	19-20 (20)	8-10 (8.6)
3. Duration between long phrases (msec)	150-180 (170)	130-170 (150)	120-160 (140)	150-170 (160)	100-160 (120)	145-190 (175)	110-150* (130) 140-190* (160)	120-190 (135)	70-74 (72)
4. Duration between long and short phrases or single phase group (msec)	29-40 (38)	27-41 (31)	21-35 (29)	26-30 (28)	19-45 (35)	40-50 (49)	38-50* (44) 45-52* (49)	36-50 (40)	11-15 (13)

* Different individuals

finer scale structures of the songs to be seen (see especially Fig. 43C,I,44H). The phrases can be resolved into compound pulse groups containing superimposed high and low amplitude pulses; the pulse repetition frequency of the high amplitude pulse is estimated to be approximately 600 Hz. Each pulse group lasts approximately 12 msec, and each is modulated with respect to the high amplitude pulses, with the modulation frequency estimated to be 82 Hz (see especially Fig. 44H).

The final calling song variation is illustrated in Figure 44E-G, from the northern base of the Blackdown Tableland. This song is generally close to the normal song (although phrases and inter-phrase intervals are shorter; Table 5), but it has additional, regularly interspersed 'buzzing' phrases, as shown in Figure 44E, which consist of short, regular phrases (duration 8.3 msec) with intervals of 23 msec. In this case, the possibility that this population is an unrecognised sibling species cannot be excluded; although the external colouration and external morphological characters of the population are typical of *P. annulata*, the male pygophore has rudimentary spur-like processes extending from the lower lobes.

***Pauropsalta ayrensis* n.sp.**

(Figs 45C,D,46,47,59)

MATERIAL EXAMINED

HOLOTYPE: 3 QUEENSLAND: Alva Beach, Ayr, Jan. 1981, A. Ewart (QM, Reg. No. T.9189).

PARATYPES: QUEENSLAND: 2♂♂, Biggenden Bluff Range, 13.xii.1970, H. Frauca, Euc. woodland; 1♂, Biggenden Bluff Range foothills, 1-7.i.1972, H. Frauca, 1♂, 9.xii.1972; 2♂♂, Burnett R., N of Eidsvold, 330 ft, 9.i.1970, at light, EB/GH/IM; 1♂, 1♀, Milmerran to Cecil Plains, x.1936, K.H.L. Key; 6♂♂, 2♀♀, Foothills of Mt Walsh N.P., 10 km S by E of Biggenden, 1-2.i.1972, H. Frauca; 1♂, Townsville, xii.1902, F.P. Dodd (labelled as syntype of *Pauropsalta annulata*, Goding and Froggatt; ex MM, 'on permanent loan' to ANIC); 1♂, Yeppoon, 14.xii.1964, I.B.F. Common, 1♀, 28.xii.1964 (ANIC). 2♂♂, Townsville, 20.i.1901, F.P. Dodd, 1902-349; 1♀, Townsville, ii.1903, F.P. Dodd, 1904-27; 1♂, Townsville, no date, F.P. Dodd, 1904-284; 3♂♂, 1♀, Westwood nr Rockhampton, 7.iii.1924, 500 ft, G.H. Wilkins (BMNH). 1♂, Townsville, 16.i.1969, R. Monroe (QM). 2♂♂, 1♀, Greta Ck, 20 mi. N of Proserpine, 1.i.1965, G. Monteith (UQIC). 1♀, Bowen, 8.xi.1973, Meurant; 23♂♂, 1♀, Bowen, 23.xii.1980, J.T. Moss; 1♀, Bowen, 3.xii.1981, J.T. Moss; 2♂♂, 2♀♀, Cathu S.F., N of Mackay, 3.xii.1981, J.T. Moss; 1♂, The Caves, Rockhampton, 2.xii.1981, J.T. Moss; 13♂♂, 5♀♀, Goomeri, 24.xii.1982, J.T. Moss; 1♂, 3 m(l) E of Marlborough, 4.xii.1972, (cow dung), R.I. Storey; 4♂♂, 1♀, Somerset Dam, 30.xii.1973, J.T. Moss (JM). 1♂, 1♀, Ayr, 12.i.1972, A.E.; 4♂♂, Bowen, 2.ii.1973, A. and M.

Walford-Huggins; 8♂♂, 5♀♀, Duaringa, xii.1983, E.E. Adams; 3♂♂, 2♀♀, Edungalba, 5.xii.1979, [Black Eyes], M.S. and B.J. Moulds; 1♂, 2♀♀, Edungalba, nr Duaringa, 2.xii.1981, G. and J. Burns, 1♀, 3.xii.1981; 1♂, 'Mourangee' Hsd, nr Edungalba, at light, 16.i.1983, E.E. Adams, 1♂, 19.i.1983, E.E. Adams; 1♀, 2 km E of 'Mourangee' Hsd, nr Edungalba, 23.i.1983, E.E. Adams; 1♂, 'Mourangee', nr Edungalba, 5.xii.1983, E.E. Adams; 1♀, 5 km SW of 'Mourangee' Hsd, nr Duaringa, 24.xii.1983, E.E. Adams; 1♂, 2♀♀, 'Mourangee', nr Edungalba, xii.1983, E.E. Adams, 1♂, [Blackish Eyes], 10.xi.1984, 5♂♂, 1♀, on tea-tree flowers, 12.xi.1985, 1♀, on sandlewood, 14.xii.1985; 2♂♂, 2♀♀, 3 km SW of Mourangee Hsd nr Edungalba, 3.xi.1986, E.E. Adams, 3♂♂, 2♀♀, 7.xi.1986; 3♂♂, 2♀♀, 'Mourangee' nr Edungalba, 13.xi.1987, E.E. Adams, 1♀, on red soil tableland, 14.xi.1987; 1♀, 5.3 km E of Mourangee Hsd, nr Edungalba, on 1 m high bush, 18.xi.1987, Robert Adams; 2♂♂, Rockhampton, 5.ii.1973, at light, A. Atkins, 1♂, 9.ii.1973; 1♀, Rockhampton, 16.xii.1977, A. Hiller; 1♀, St Margarets Ck, c. 20 m(l) S Townsville, 1.ii.1973, A. and M. Walford-Huggins; 7♂♂, 13♀♀, Tinaroo Falls Dam, Atherton Tableland, 12.ii.1986, D. Lane; 1♀, Townsville, 7.i.1987, M.S. and B.J. Moulds; 1♂, Yeppoon, 28.i.1983, R. Eastwood (MSM). 1♂, Alva Beach, Ayr, (recorded), 29.i.1981, A.E.; 3♂♂, Ayr, low trees/shrubs after rains, 12.i.1972, A.E.; 1♂, 1♀, Ayr, i.1981, A.E.; 2♂♂, 1♀, Round Hill Head, 19.i.1981, T.H. Cribb; 1♂, S Molle Is., Whitsunday Group, 20.v.1987, A.E.; 1♂, Splitters Ck, Somerset Dam, 5.i.1979, A.E. (AE).

ETYMOLOGY

Derived from the town of Ayr, northern Queensland, where this species was first recognised, and where it is common.

DESCRIPTION

MALE: Head: Mainly black. Postclypeus shiny black anteriorly with narrow pale brown lateral margin, together with very small pale brown dorsal spot on midline; dorsal surface black; yellow and silver pubescence present. Anteclypeus shiny black with silver pubescence. Rostrum brown becoming darker apically; extends to mid coxae. Dorsal surface of head shiny black with slightly depressed triangular pallid area between ocelli, apex anteriorly pointing, and base extending to posterior margin of head; silver and yellow pubescence sparsely distributed, with conspicuous silver pubescence behind eyes. Antennae black with paler apical terminations. Ocelli pink to red. Eyes dark reddish-brown to black-brown. Vertex lobes black, each with small dorsal pallid marking.

Thorax: Pronotum shiny black, grading to deep brown adjacent to central fascia; central fascia pale yellow-brown and not always extending to

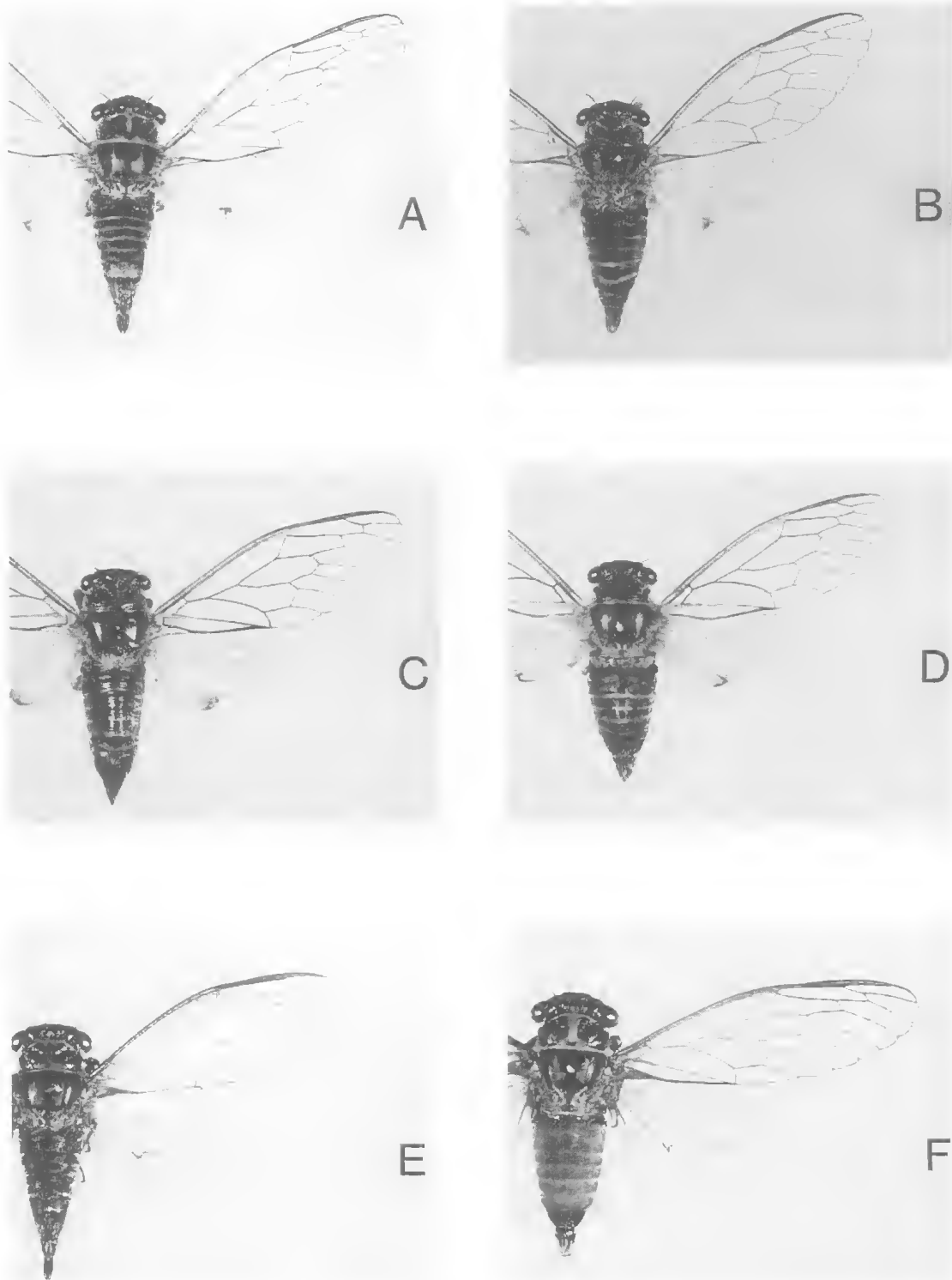


FIG. 45. A,B *P. annulata* ♀, ♂. C,D *P. ayrensis* ♀, ♂. E,F *P. eyrei* ♀, ♂. Each photograph $\times 2$ natural size. Photographs: D.M. Reeves.

pronotal collar; short yellow pubescence present except adjacent to central fascia; pronotal collar and ridge along the anterior margin of pronotum are pale yellow to pale brown.

Mesonotum black with pale yellow-brown to orange-brown cruciform elevation (black anteriorly), extending to ridges between wing grooves, and to basal membranes of fore wings; silvery yellow pubescence, most conspicuous around cruciform elevation.

Legs: Coxae dark brown, distally paler; femora dark brown, distally paler; tibiae, tarsi, claws, and spines of fore legs dark brown; mid and hind tibiae and tarsi generally pale yellow-brown, with dark brown claws.

Wings: Costal veins of fore wings pale to medium brown, with remaining venation medium to dark brown, becoming darker towards the apical cells and ambient veins; pterostigma dark brown; infuscation spots on hind wings clearly defined.

Tymbals: Dorsal ridge extends across dorsal inter-ridge sclerite; lower two ridges joined anteriorly; small but distinct basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated; median area shiny black, somewhat domed; posterior region pale sandy-brown with finely rugose surface; declivous flange around outer margin; posterior termination of opercula rounded; silver pubescence variably present; broadly longitudinally undulate i.e. parallel to body axis.

Abdomen: Tergites shiny black with prominent orange-brown to orange posterior margins to tergites 3 to 8, also extending along lower margins; these orange margins widest dorsolaterally and laterally; short silver-yellow pubescence sporadically developed, especially dorsolaterally and laterally. Sternite II black; sternites III to VII orange, each with median black area, not always extending across posterior margins of sternites; dark pigmentation most extensive on sternite VII; sternite VIII orange-brown with anterior, dorsolateral black pigmentation; silver pubescence present.

Genitalia: Pygophore brown, becoming black dorsally and anteriorly; upper lobes erect, and somewhat widened and flattened terminally with slightly hooked termination; lower lobes distinct; inner lobes somewhat enlarged, elongated, apically acute, and posteriorly pointing; claspers contain a pair of hooked processes; beak distinct and acute; aedeagus with dorsal pseudoparameres which bifurcate and join the endotheca near to gonocoxite IX; pseudoparameres tapering,

apically acute, slightly undulate; endotheca broadened apically (i.e. 'trumpet-like') with minor apical ornamentation.

FEMALE: Colouration and markings of head, thorax, legs, wings similar to male, with slightly darker venation on fore wings. Abdomen: Similar to male; zones adjacent to posterior margins of tergites 3 to 8 orange-brown to orange, not extending to lower edges; tergite 9 orange-brown laterally, with black dorsal fascia (formed by coalescence of a pair of dorsolateral fasciae) which broadens and extends around anterior margin of tergite. Sternites II to VII brown to orange-brown, each with diffuse median dark region not extending across individual sternite margins; ovipositor sheath not extending significantly beyond termination of tergite 9.

MEASUREMENTS: 36♂♂ and 8♀♀. Body length: ♂ 12.7-16.0 (14.11); ♀ 13.0-15.2 (14.19). Fore wing length: ♂ 14.7-18.3 (16.19); ♀ 15.5-17.8 (16.83). Head width: ♂ 3.9-4.6 (4.28); ♀ 4.2-4.6 (4.38).

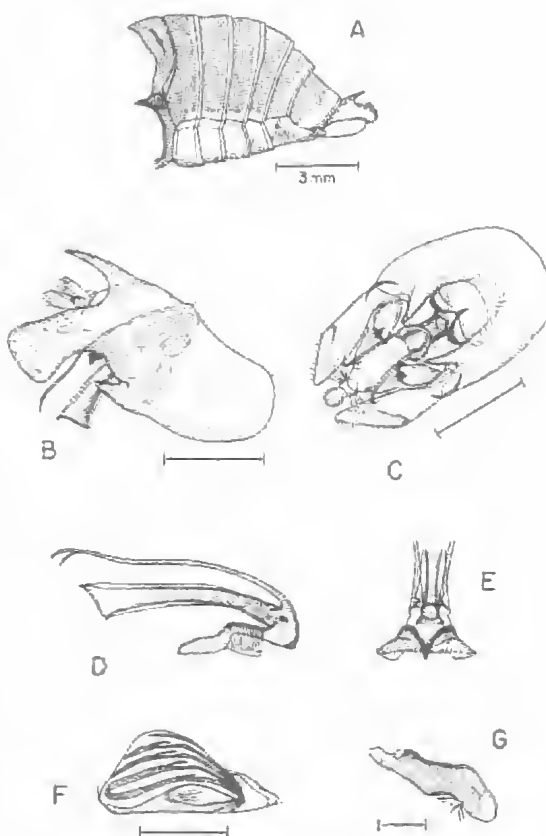
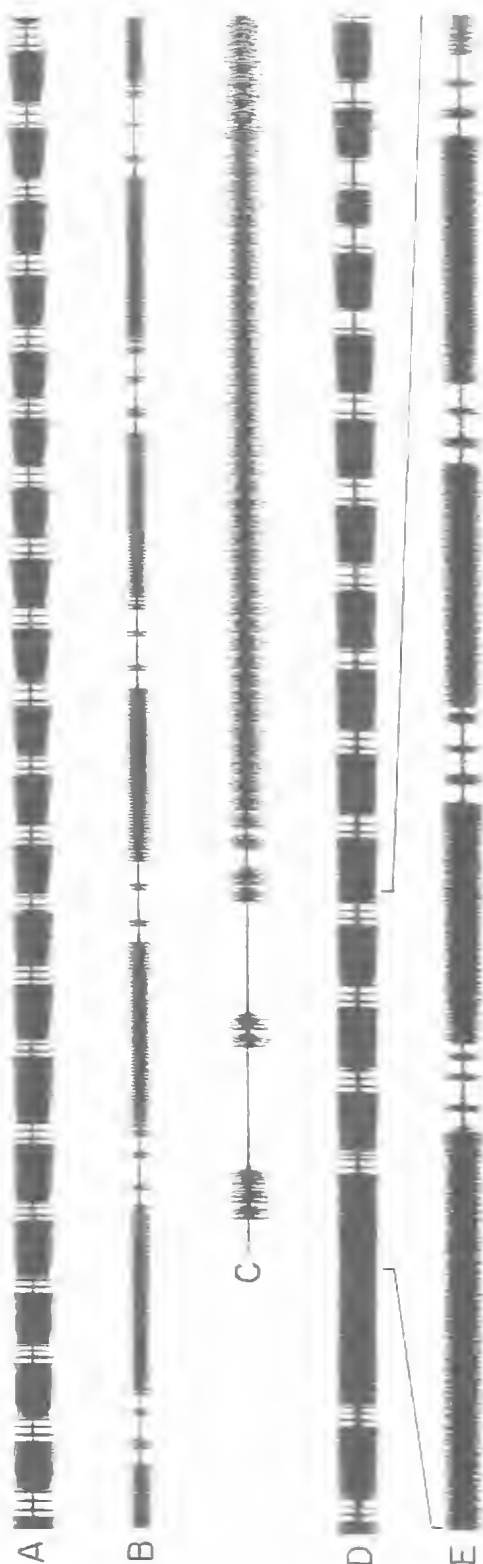


FIG. 46. *Pauropsalta ayrensis* sp.n., ♂, from Ayr, northern Queensland. Symbols A to G, and scales, as in Fig. 2.



Pronotum width: ♂ 3.2-4.0 (3.61); ♀ 3.6-3.9 (3.66).
Abdomen width: ♂ 3.6-4.6 (4.11); ♀ 3.6-4.3 (3.95).

COMMENTS

P. ayrensis and *P. annulata* are closely similar and distinguishing features are given under *P. annulata*. This species is also similar to *P. corticinus*, *P. fuscata* and *P. siccanus*. Males of *P. ayrensis* are most easily distinguished by their brown, ascending, and slightly hooked pygophore upper lobes (compare Fig. 46B with 16B, 19B-22B, and 26B) and by the orange-brown to orange tergite margins. Females, however, may be more difficult to distinguish, but the orange-brown to orange tergite margins are usually characteristic of *P. ayrensis*.

DISTRIBUTION

Along eastern Queensland from the Atherton Tableland southwards to Somerset Dam and Milmeran in southeastern Queensland (Fig. 59). In the northern part of its range, it occurs on or near the coast, but occurs further inland in its southern range. Its habitat is variable and includes open dry forest, open shrubland, suburban gardens and parkland, and also coastal dunes. It rests and sings in isolated trees and shrubs, both on the trunks and outer foliage, and also frequently in long grass, tending to occur lower down than *P. annulata*, although as shown in Figure 59, their ranges overlap. Records occur between October to May.

SONG

Ayr song: Consists of a series of two or three short phrases, followed by a long phrase; there is a slight rise of amplitude during the progress of the long phrase (Fig. 47). All phrases, when examined on the expanded time scale, are seen to comprise pulse groups showing an amplitude modulation with a frequency of 81-86 Hz; the duration of the pulse groups range between 10-14

FIG. 47. Oscillograms of calling songs of *P. ayrensis* from: A to C, Alva Beach, Ayr (Jan. 1981); D, E, Splitters Ck, Somerset Dam (Jan. 1979). Records shown at three time scales.

msec. Pulse repetition frequencies are estimated between 400-425 Hz.

The short phrases consist mostly of double pulse groups, but may less commonly consist of one or three pulse groups. Each pulse group itself consists of four compound pulse subgroups, these not being clearly resolvable from the available data. Lengths of the long phrases varies between 0.70-0.92 sec (av. 0.72), with intervals between long phrases varying between 0.20-0.38 sec (av. 0.28).

Somerset Dam Song (S Queensland): This is similar in overall structure, although in the recorded song, the phrases are not so clearly resolved into the pulse groups. Duration of the long phrases varies between 0.64-0.90 sec (av. 0.77), rarely extending to greater than 3 sec; intervals between long phrases range between 0.26-0.48 sec (av. 0.33).

***Pauropsalta eyrei* (Distant) n.comb.**
(Figs 45E,F,48,49,59)

Melampsalta eyrei Distant 1882:130, Pl.VII, Figs 12, 12a-b; Goding and Froggatt, 1904:654; Distant, 1906b:175; Froggatt, 1907:354; Ashton, 1914:353; Kato, 1932:187; Burns, 1957:652; Duffels and van der Laan, 1985:284.

Cicadetta eyrei (Distant) Metcalf, 1963:312; Weidner and Wagner, 1968:149; Dugdale, 1972:879.

MATERIAL EXAMINED

HOLOTYPE: ♂ of *Melampsalta eyrei* in BMNH: Peak Downs (no date). Weidner and Wagner (1968:149) list 3 ♂ 'syntypes' in the Hamburg Museum that have not been examined.

OTHER MATERIAL: 155 specimens from following localities. QUEENSLAND: Archer's Ck, Mt Garnet Road; Barron Falls, Kuranda; Biggenden; Biggenden, Bluff Range Foothills; Pistol Gap S of Byfield; Townsville; Yeppoon (ANIC). Annan R.; Cairns; Cooktown; Kuranda; N Queensland; Pine Ck nr Cairns; Ravenshoe (BMNH). Cairns; Claudie R.; Coen, Cape York; Daintree R.; Dunk Is.; Kuranda; Meringa; Silver Plains, Coen (MV). Cairns; Mt Isa Mines; Rodds Bay; Tully; Yeppoon (UQIC). Barron Falls, Kuranda; Cairns; Cooktown; 19.25S 144.20E, Einasleigh R., 22 km S by W of Lyndhurst Hsd; Georgetown; Gilbert R. via Goergetown; Rungoo Mt Range, 20 km N of Ingham; Station Ck, nr Mt Carbine; Townsville; Waterfall Ck, 20 mi. N of Rollingstone (JM). Bald Hills Stn, 30 km N of Cooktown; Butcher Ck, 20 km W of Cloncurry; Townsville (MSM). Ayr; Carnarvon Lodge, entrance to Carnarvon Gorge; 'Early Storms', nr Carnarvon N.P.; 'Rewan', nr Carnarvon N.P.; S Molle Is. (AE).

DESCRIPTION

MALE: Head: Postclypeus shiny black anteriorly with clearly defined orange-brown margin, extending between transverse ridges, and

triangular orange-brown patch dorsally on midline; dorsal surface black; yellowish pubescence. Anteclypeus black with silver-yellow pubescence. Rostrum pale brown, becoming dark brown to black apically; extends to mid coxae. Gena and mandibular plate black, with small pale orange-brown triangular area along intervening suture adjacent to postclypeus, and a pallid marginal ridge to mandibular plate; conspicuous silver-yellow pubescence. Antennae dark brown. Vertex lobes orange-brown. Dorsal surface of head shiny black with small triangular pallid depressed area on longitudinal suture between ocelli; yellowish pubescence behind eyes.

Thorax: Pronotum dark brown to black with sharply defined pale yellow-brown to orange anterior margin, pronotal collar, and broad central fascia, the latter broadening anteriorly and especially posteriorly adjacent to the anterior margin and pronotal collar, respectively; sparse yellowish pubescence.

Mesonotum black with a pair of sharply defined irregular dorsolateral yellow-brown to orange

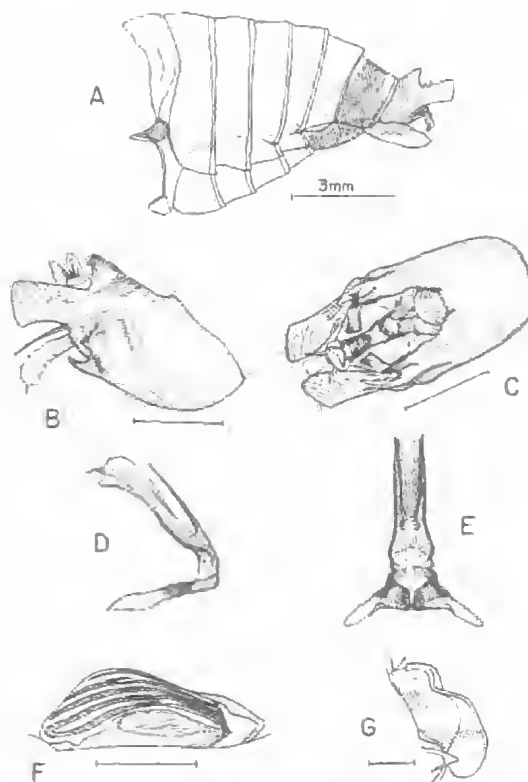


FIG. 48. *Pauropsalta eyrei* (Distant) comb.n., ♂, from Cooktown, northern Queensland. Symbols A to G, and scales, as in Fig. 2.

fasciae, broadening inwards and almost coalescing medially; a pair of broad oblique lateral yellow-brown to orange fasciae join the dorsolateral fasciae adjacent to anterior region of cruciform elevation; cruciform elevation yellow-brown with black anterior area; yellowish pubescence conspicuous adjacent to wing grooves.

Legs: Coxae yellow-brown to orange-brown with narrow dark brown dorsal margins; remaining colouration orange to yellow-brown, with dark brown tips to claws and spines.

Wings: Venation very pale brown, becoming darker brown distally and along ambient veins; infuscation spots on hind wings faintly developed, and absent along vein 1A + 2A of fore wings.

Tymbals: Dorsal ridge extends across dorsal inter ridge sclerite; lower two ridges joined anteriorly; distinct basal spur.

Opercula: Broadly sickle-shaped, longitudinally undulate, with rounded inward (posterior) terminations; gently domed and shiny median area; declivous marginal flange best developed along outer margin; colour orange-brown except for diffuse brownish area adjacent to anterior margin; surface finely rugose.

Abdomen: Tergites 2 to 7, and sternites II to VI, yellow to orange, with only a small brown marking dorsally and dorsolaterally on tergite 2; tergite 8 dominantly black with narrow irregular anterior and posterior orange-brown dorsal margins; sternite VII mostly dark brown to black, paler along anterior margin; sternite VIII dark brown to black anteriorly, grading orange-brown posteriorly.

Genitalia: Pygophore deep brown anteriorly, becoming yellow-brown adjacent to, and including upper lobe; upper lobe with more or less oblique flat terminations (as viewed laterally); inner lobe conspicuously raised, acutely tapering, and posteriorly pointing; lower lobe slightly raised; small hooked claspers; dorsal pseudoparamers shorter than endotheca, and bifurcating and joining endotheca near (but not adjacent to) gonocoxite IX; endotheca markedly enlarged apically, with pair of small terminal lateral spikes.

FEMALE: Head, thorax, legs, wings, and sternites as in male. Tergites orange to orange-brown with dorso-anterior black markings which narrow and terminate dorsolaterally on tergites 3 to 8; tergite 9 orange-brown to medium brown with pair of dark brown longitudinal dorsolateral fasciae which join posteriorly, but not extending to posterior tergite margin; ovipositor sheath extends approximately 1-1.5 mm beyond termination of tergite 9.

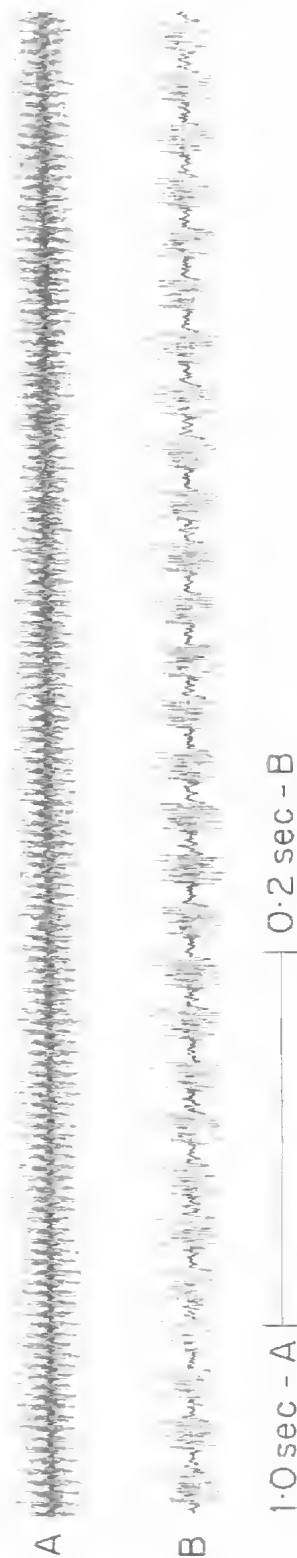


FIG. 49. Oscillograms of calling song of *P. eyrei* from Townsville. Two time scales are shown.

MEASUREMENTS: 18♂♂ and 13♀♀. Body length: ♂ 13.2-17.0 (15.38); ♀ 15.8-18.8 (17.25). Fore wing length: ♂ 14.7-20.3 (19.02); ♀ 19.6-22.4 (20.89). Head width: ♂ 4.1-5.6 (4.96); ♀ 4.8-5.6 (5.33). Pronotum width: ♂ 3.3-4.6 (4.10); ♀ 3.8-4.6 (4.26). Abdomen width: ♂ 3.6-4.8 (4.26); ♀ 3.6-4.8 (4.08).

COMMENTS

The colouration and size (Fig. 1) of this insect are distinctive.

DISTRIBUTION

From the Biggenden and Carnarvon Gorge areas in southern central Queensland, northwards to Iron Range, Cape York Peninsular, and westwards towards the Gulf Country, with northwestern records near Cloncurry and Mt Isa (Fig. 59). Habitat preference is for dry, relatively short, open forest and semi-grassland.

SONG

A single recording from Townsville (JM) consists of a continuous train of repeated phrases, with no apparent systematic variation in pattern (Fig. 49). Each phrase has a duration of 16-18 msec, with interphrase intervals of 10-12 msec. The expanded time scale oscillogram, although of limited resolution, indicates that each phrase can be resolved into ten distinct pulses.

P. AQUILUS SPECIES-GROUP

Two species are recognised in this group, only one of which occurs in Queensland (*P. aquilus*). The second is *P. infusata* (Goding and Froggatt), currently known only from South Australia. Both are relatively small cicadas (12-17 mm body length), almost entirely black and thus highly cryptic. The male genital structures suggest closer affinities with the *annulata* group than with the other species-groups, but marked differences nevertheless exist.

Pauropsalta aquilus n.sp. (Figs 50,51,52E,F,59)

Pauropsalta species D Ewart, 1988:181,182, figs 2,9D, Pl. 1F.

MATERIAL EXAMINED

HOLOTYPE: ♂ QUEENSLAND, Mon Repos nr Bundaberg, 19.xii.1983, (Recorded on tape), A. Ewart (QM, Reg. No. T.9190).

PARATYPES: QUEENSLAND: 1♂, 1♀, Mon Repos, nr Bundaberg, 19.xii.1983, A.E. (ANIC). 1♂, 1♀, L. Broadwater, 30 km SW of Dalby, 12.ii.1984, A.E.

(BMNH). 1♂, 1♀, L. Broadwater, 30 km SW of Dalby, 12.ii.1984, A.E. (MNDN). 1♀, Mon Repos, nr Bundaberg, 19.xii.1983, A.E. (QM). 1♂, 1♀, Carnarvon N.P., 8.xii.1979, mv lamp, G. Daniels, M.A. Schneider; 2♂♂, 1♀, Carnarvon N.P., 8-10.xii.1979, M.A. Schneider, G. Daniels; (UQIC). 2♂♂, 2♀♀, Carnarvon N.P. nr Rolleston, 20.i.1973, J.T. Moss; 14♂♂, 6♀♀, Carnarvon Gorge, 8-12.xii.1985, J.T. Moss and A.E.; 5♂♂, 2♀♀, Curtis ls. nr Gladstone, 30.x.1983, J.T. Moss; 3♂♂, 2♀♀, L. Elphinstone, nr Glenden, 20-29.ii.1984, J.T. Moss; 1♂, 1♀, Toogoom, Hervey Bay, 18.x.1983, J.T. Moss (JM). 3♂♂, Campaspe R. crossing, WSW of Charters Towers, 16.i.1984, (light grey eyes), M.S. and B.J. Moulds; 1♀, L. Broadwater nr Dalby, site F, 27°21'S 151°06'E, 25.xii.1986, G. and A. Daniels, 1♀, site B, 30.i.1987, 1♀, site F, 31.i.1987; 2♂♂, L. Broadwater, via Dalby, 9.xii.1987, Monteith and

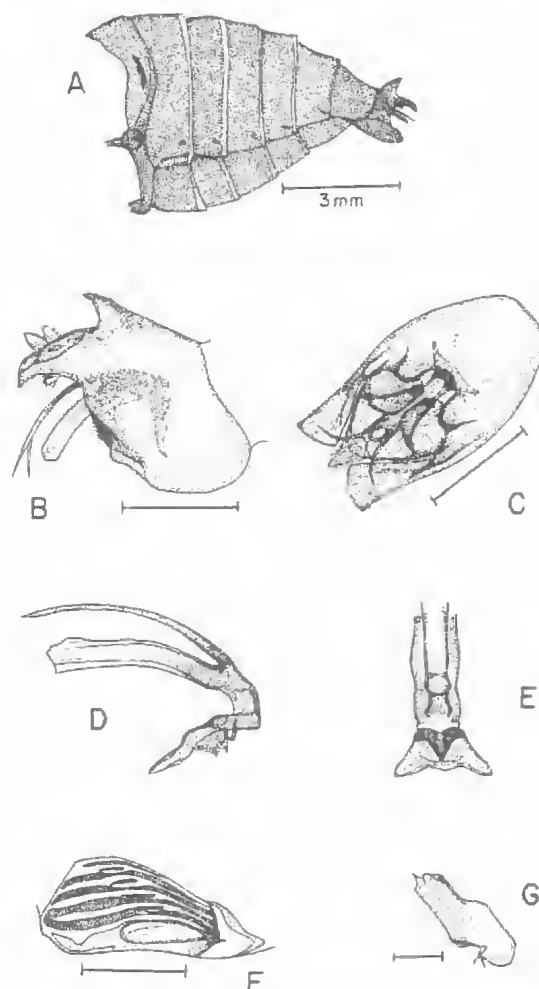


FIG. 50. *Pauropsalta aquilus* sp.n., ♂, from Mon Repos, near Bundaberg, southern Queensland. Symbols A to G, and scales, as in Fig.2.

Thompson; 1♂, 1♀, Mon Repos, nr Bundaberg, 19.xii.1983, A.E.; 16♂♂, 10♀♀, 20 km N of Monto, 6.xii.1979, M.S. and B.J. Moulds; 2♂♂, 1♀, Mt Moffat N.P., Top Moffat Camp, 13-15.xii.1987, Monteith, Thompson and Yeates (MSM); 14♂♂, 7♀♀, Carnarvon Gorge, 8-12.xii.1985, J.T. Moss and A.E.; 19♂♂, 16♀♀, L. Broadwater, 30 km SW of Dalby, 12.ii.1984, A.E.; 6♂♂, 1♀, Mon Repos, nr Bundaberg, 19.xii.1983, A.E. (AE).

ETYMOLOGY

Derived from Latin, meaning blackish, or dark coloured.

DESCRIPTION

MALE: Head: Black with pale brown markings. Postclypeus shiny black anteriorly with pale brown margins, extending slightly into grooves between transverse ridges; small pale brown dorsal spot on midline; dorsal surface black; short golden-yellow pubescence, especially on dorsal surface. Anteclypeus black with white pubescence. Rostrum brown, becoming darker apically; reaches hind coxae. Antennae brown, paler apically. Mandibular plate and gena black with pale brown intervening suture and conspicuous pale-yellow pubescence. Ocelli deep red. Eyes medium brown. Dorsal surface of head black with wedge-shaped, anterior-pointing, pale brown area in longitudinal suture between ocelli, extending to posterior margin of head; short, scattered yellow-brown pubescence, with conspicuous silver pubescence behind eyes. Vertex lobes pale brown.

Thorax: Pronotum black with central fascia pale brown, somewhat spindle-shaped; short yellow pubescence, especially concentrated between, and in area behind oblique fissures; pronotal collar pale brown.

Mesonotum black with pale brown dorsolateral fasciae, widening medially inwards, and extending to cruciform elevation; wing grooves pale brown; cruciform elevation pale brown; silver-yellow pubescence most conspicuous adjacent to wing grooves, and anteriorly to cruciform elevation.

Legs: Coxae deep brown to black, with longitudinal pale fasciae extending along anterior margins of fore coxae; femora dark brown with prominent broad longitudinal fasciae on fore femora; hind femora grade to pale brown distally; fore and mid tibiae mainly dark brown; hind tibiae pale pink-brown; fore tarsi dark brown while mid and hind tarsi become progressively paler; claws and spines deep brown.

Wings: Fore wing venation brown, tending to become darker distally around apical cells and ambient veins; fore wing costal vein reddish-

brown, darker along anterior margin; pterostigma dark brown to black; infuscation spots on hind wings well developed.

Tymbals: Dorsal ridge extends across dorsal inter-ridge sclerite; two (or three in some specimens) lower ridges joined anteriorly; distinct basal spur.

Opercula: Somewhat elongated, oriented oblique to body axis, with rounded posterior termination; declivous flange along outer margin; anterior region dark brown and somewhat shiny, grading posteriorly to pale yellow-brown colouration with finely rugose and less shiny surface; silvery pubescence especially conspicuous anteriorly.

Abdomen: Tergites black, grading to deep brown adjacent to dorsolateral posterior margins of tergites 4 to 7, and anterior region of tergite 8; tergite margins between tergites 3 to 8 are pale greenish-brown; silver-yellow pubescence sporadically developed, occurring predominantly dorsolaterally. Sternites deep brown to black, with narrow pale yellow-brown margins, most conspicuous between sternites III to V; sternite VIII black, grading to dark brown posteriorly.

Genitalia: Colour deep brown to black; upper lobes form a pair of ascending, blinker-like structures, with acute and inward pointed terminations; lower lobes rounded and not sharply defined; inner lobes raised, somewhat bulbous, but clearly defined; claspers thickly ridged and rounded. Aedeagus with a pair of dorsal pseudoparameres which are tapering and acute, and join endotheca close to gonocoxite ix.

FEMALE: Pigmentation and markings similar to male. Pronotum dominantly pale brown, as is mesonotum. Tergites black with narrow brown dorsolateral zones adjacent to posterior margins of tergites 3 to 6; tergites 7 to 9 black; tergite margins brown, extending along the lateral, lower margins of tergites; silvery pubescence most noticeable dorsolaterally. Sternites black; ovipositor sheath does not extend significantly beyond termination of tergite 9.

MEASUREMENTS: 32♂♂ and 21♀♀. Body length: ♂ 12.4-15.7 (14.58); ♀ 14.0-16.5 (15.31). Fore wing length: ♂ 16.0-18.8 (17.85); ♀ 17.8-20.3 (18.91). Head width: ♂ 4.4-5.1 (4.82); ♀ 4.8-5.3 (5.10).

FIG. 51. Oscillograms of calling songs of *P. aguilus* from: A to C, Mon Repos, near Bundaberg (Dec. 1983); D to I, Lake Broadwater, near Dalby (two separate specimens; D to F based on field recording; G to I recorded in captivity; Feb. 1984); J, entrance to Carnarvon Gorge, Carnarvon Ck (Carnarvon National Park; Dec. 1985). Three time scales shown.

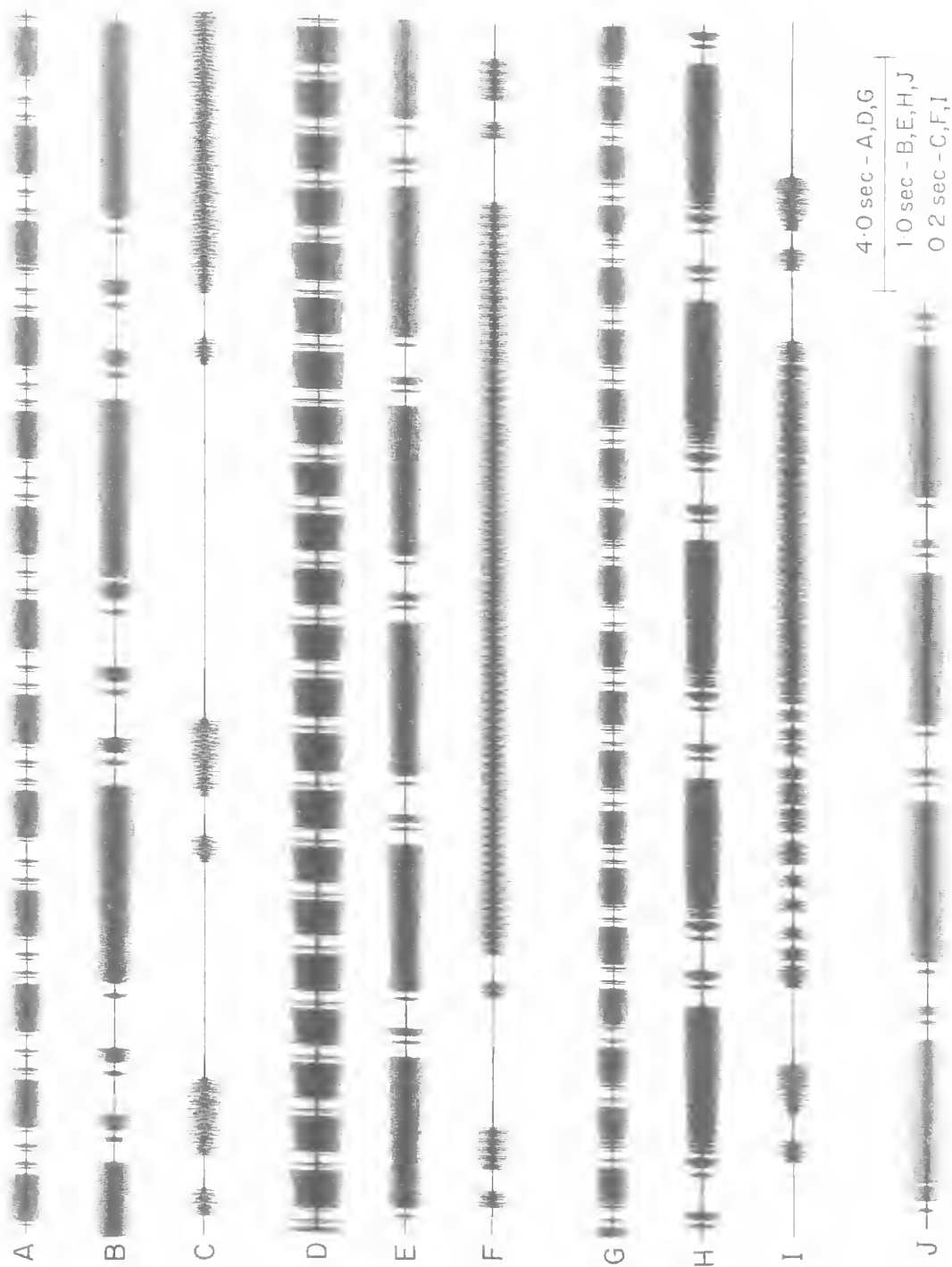


TABLE 6. Comparative data on song patterns of *P. aquilus*.

	L. Broadwater (Dalby) Specimen 1 — recorded in captivity	L. Broadwater (Dalby) Specimen 2 — recorded in field	Bargara (Bundaberg) Recorded in captivity	Carnarvon Gorge Recorded in field
Duration of long phrases (sec)	0.60-0.66 (av. 0.63)	0.56-0.66 (av. 0.63)	0.78-0.87 (av. 0.83)	0.64-0.71 (av. 0.68)
Duration between long phrases (sec)	0.36-0.39 (av. 0.38)	0.26-0.32 (av. 0.29)	0.75-0.88 (av. 0.78)	0.32-0.33 (av. 0.32)
Short Phases: (1) Duration of shortest phrases (msec)	18-20 (av. 19.2)	14-15 (av. 14.4)	23-24 (av. 23.5)	15-20 (av. 19.1)
(2) Duration of longer phrases (msec)	44-45 (av. 44.7)	36-37 (av. 36.4)	67-68 (av. 68.0)	35-39 (av. 37.3)
(3) Interval between short and longer phrases (msec)	16-20 (av. 17.7)	18	26-33 (av. 30.5)	19-20 (av. 19.6)
Duration of basic pulse group units (msec)	9.5	7.7	11.4	9.9

Pronotum width: ♂ 4.1-4.9 (4.45); ♀ 4.5-4.9 (4.70).
Abdomen width: ♂ 4.1-4.7 (4.42); ♀ 4.3-4.8 (4.53).

COMMENTS

This species is superficially similar to both *P. corticinus* and *P. fuscata*. Length of rostrum, which extends to hind coxae in *P. aquilus*, is a convenient distinguishing character. In the case of the males, the shape of the upper pygophore lobes (compare Fig. 50B with 16B, and 19B-22B) also enables ready recognition.

DISTRIBUTION

Based on specimen and aural records, *P. aquilus* occurs from near Dalby in southeastern Queensland northwards to near Greenvale, northern Queensland (Fig. 59). Found in open forest, on casuarinas, melaleucas, and eucalypts, invariably in proximity to lakes, swamps, rivers, and even estuaries or the open sea (although not along the coastal edge). The insect sings on the main tree trunks from heights between 1 to 20 metres.

SONG

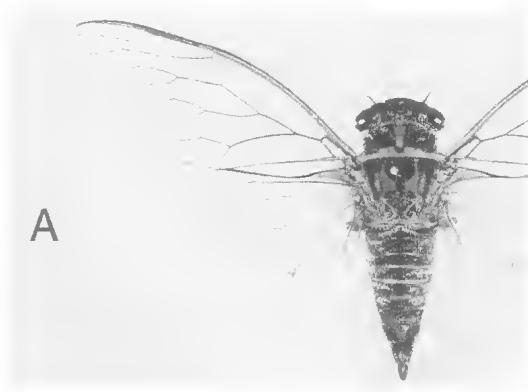
The following data are based on four sets of songs, two from the Dalby region, one from near Bundaberg, and the fourth from Carnarvon Gorge (Fig. 51). Each basic song pattern shows some variation. The Dalby song patterns exhibit either two short double phrases followed by a long phrase, or one short double phrase, one short

single phrase, followed by the long phrase. The Bundaberg song pattern, however, consists of two double short phrases, followed by a short single phrase, again followed by a long phrase. The Carnarvon song consists of a double short phrase, followed by a single short phrase, followed by the long phrase. In all examples, this basic song is regularly and continuously repeated. In addition, all patterns show an initial rise in amplitude in each set of phrases, the amplitude then remaining at an approximately constant level.

The song structure comprises a compound pulse group unit which varies in length from 7.7 to 11.4 msec (see Table 6). The various long and short phrases are built up from this basic unit, which is either emitted singly, or is combined consecutively in varying numbers. In the Dalby song recorded from a specimen held in captivity, the initial parts of the long phrases are not completely continuous, with small and irregular gaps present, varying between 1 to 15 msec in duration. This is only rarely seen in the other two song patterns (and thus may result from recording the insect in captivity).

The compound pulse group units of the two Dalby specimens when seen on an expanded time scale (Fig. 51F,I) comprise nine distinct pulses (each in reality finer scaled pulse groups, which

FIG. 52. A,B *P. virgulatus* ♀, ♂. C,D *P. siccanus* ♀, ♂. E,F *P. aquilus* ♀, ♂. G,H *P. basalis* ♀, ♂. Each photograph ×2 natural size. Photographs: D.M. Reeves



cannot be further resolved with the available data); pulse repetition frequencies are estimated to be in the range 850-920 (specimen 1) to 1150-1180 Hz (specimen 2). In the example of the Bundaberg song, these 'pulses' cannot so readily be resolved, but they do show a clear tendency to occur in triple groupings within each pulse group unit.

P. BASALIS SPECIES GROUP

This group contains one species, the smallest of the *Pauropsalta*, which is confined to northern Queensland. The male genitalia suggest this to be the most divergent of the species-groups with no clear affinity to any of the other four groups.

Pauropsalta basalis Goding and Froggatt (Figs 52G,H,53,54,55)

Pauropsalta basalis Goding and Froggatt, 1904:625,626;
Distant, 1906b:179; Ashton, 1914:355; Metcalf,
1963:405; Duffels and van der Laan, 1985:300; St
Leger Moss, 1988:30.

Melampsalta basalis (Goding and Froggatt) Burns,
1957:647.

Pauropsalta endeavourensis Distant, 1907a:423;
Metcalf, 1963:407; Duffels and van der Laan,
1985:301. *N.Syn.*

Melampsalta endeavourensis (Distant) Burns, 1957:651.
Cicadetta endeavourensis (Distant) Dugdale,
1972:879,880.

MATERIAL EXAMINED

HOLOTYPE: ♂ of *Pauropsalta basalis*, in ANIC;
Townsville, Queensland, F.P. Dodd, Dec '03; ex MM,
'on permanent loan' to ANIC, bearing red holotype
label.

HOLOTYPE: ♂ of *Pauropsalta endeavourensis* in
BMNH; Endeavour R., Queensland; Distant Coll. 1911-
383; red type label; 9. 28.1.07. W.W.F.

OTHER MATERIAL: 27♂♂ and 6♀♀ from following
localities: QUEENSLAND: Cairns (MV). Sand quarry, Ayr
(QM). Wenlock R., 13°05'S, 142°56'E (UQ1C).
Cooktown; Mackay; Proserpine (JM). Laura R. nr
Laura; 10 km S of Woodstock, S of Townsville; York
Downs, 50 km E of Weipa (MSM). Ayr (AE).

DESCRIPTION

MALE: Head: Postclypeus deep brown to black
with broad pale brown margin and conspicuous
pink-brown area dorsally on midline; dorsal
surface black anteriorly and on posterior margins,
elsewhere brown; inconspicuous silvery
pubescence. Anteclypeus black dorsally, grading
ventrally to pale brown. Rostrum pale brown,
becoming paler apically; extends between mid and
hind coxae. Gena and mandibular plate black with
intervening pale brown suture, extending to lateral

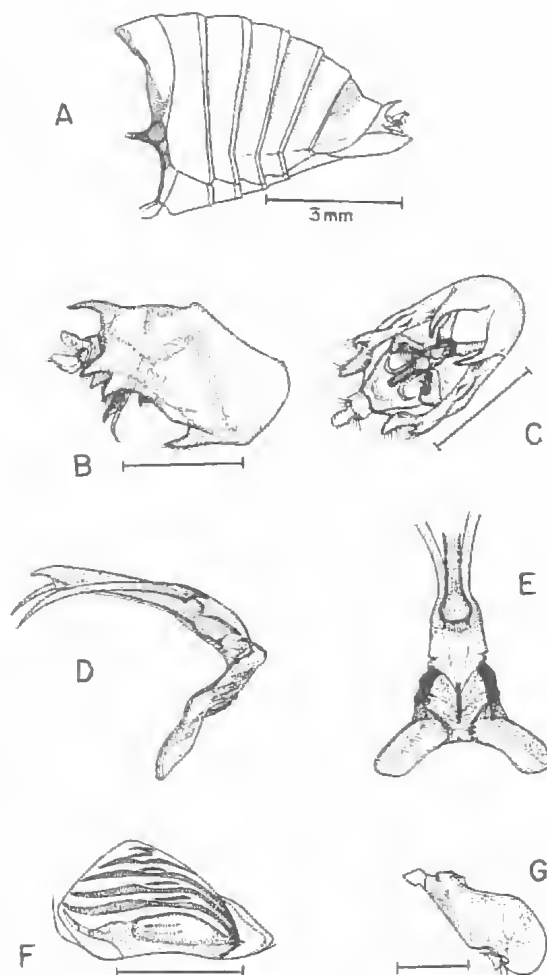


FIG. 53. *Pauropsalta basalis* Goding and Froggatt, ♂, from Ayr, northern Queensland. Symbols A to G, and scales, as in Fig. 2.

clypeal suture; conspicuous silver-yellow
pubescence present. Antennae deep brown. Dorsal
surface of head black with triangular pale brown
area situated on suture extending from median
ocellus to posterior margin of head; yellow-gold
pubescence most conspicuous along anterior
margin, and behind eyes. Ocelli pink. Eyes dark
brown. Vertex lobes pale brown.

Thorax: Pronotum pale to medium brown with
posteriorly tapering pale brown central fascia with
black margins which extend outwards along the
anterior and posterior margins of pronotum;
irregular and broken black markings adjacent to,
and between the oblique fissures, and in areas
behind posterior oblique fissures; pronotal collar
pale brown; silver-yellow pubescence sparsely
present.

Mesonotum brown with broad black lateral fasciae, widening towards anterior margin; short, broad, black dorsolateral fasciae coalescing along anterior margin of mesonotum; median fascia mostly poorly defined, being diffuse anteriorly where it coalesces with the dorsolateral fasciae; cruciform elevation mainly pale pinkish-brown, black anteriorly and laterally; gold-yellow pubescence erratically present, most notably around the cruciform elevation.

Legs: Fore coxae pale brown with dark brown, broad, ventrally tapering fasciae along posterior margins; mid and hind coxae dark brown, becoming paler distally; femora pale brown with dark brown longitudinal fasciae, which are only present on inside margins of fore femora; fore tibiae medium brown, otherwise pale brown; tarsi pale brown, becoming darker distally on fore legs; claws and spines dark brown.

Wings: Fore wings; costal vein pallid, with remaining venation dark brown; pterostigma pale. Venation of hind wings paler; infuscation spots weakly developed; faint infuscation adjacent to plaga.

Tymbals: Dorsal ridge very small, and often difficult to see in older or worn specimens; poorly developed basal spur.

Opercula: Roughly sickle-shaped, obliquely elongated, with broad and rounded posterior termination; colour sandy-brown, darker brown anteriorly; declivous flange along outer margin; posterior margin does not extend beyond sternite II; longitudinally undulate (i.e. parallel to body axis); surface very finely rugose; silver pubescence present, especially around anterior margin.

Abdomen: General shape slightly bulbous. Tergite 2 has irregular, black, anterior pigmentation, otherwise yellow-brown, becoming slightly reddish dorsally; tergites 3 to 8 generally sandy-brown, tending reddish-brown or orange towards posterior margins; tergites 4 to 8 also show median to dorsolateral darker colouration along anterior margins which is more strongly developed towards tergite 8; tergite margins orange-yellow; sparse silver-yellow pubescence, most conspicuous dorsally on tergite 2. Sternite II sandy-brown with darker lateral margins; sternite III to VII sandy-brown becoming more strongly reddish towards sternite VII; sternite margins yellow to orange; sternite VIII rufous.

Genitalia: Colour pale brown; upper and lower lobes ascending, acute, tapering; lower lobe apically hooked; inner lobe ascending, posteriorly inclined, acutely tapering; claspers each with two sets of curved ridge-like processes; aedeagus with

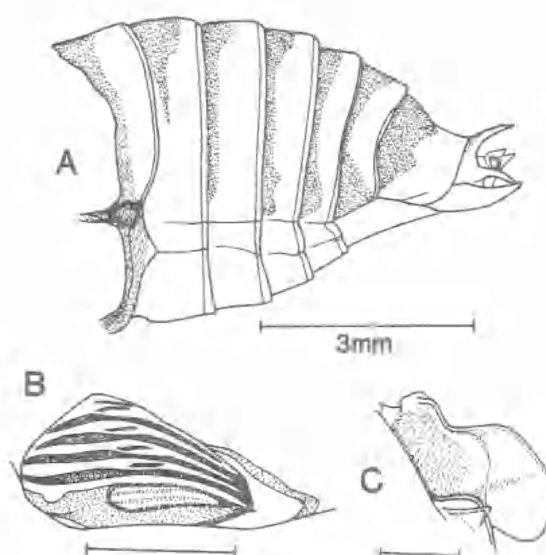


FIG. 54. *Pauropsalta endeavourensis* Distant: Holotype, ♂, BMNH from Endeavour River, Queensland. A: Abdomen, B: Left tymbal, C: Left opercula. Scales 1 mm except where indicated otherwise.

a pair of pseudoparameres attached dorsally, but sloping ventrally across endotheca; pseudoparameres curved, apically tapering.

FEMALE: Similar colouration and markings as in male, being somewhat paler due to less extensive darker areas of pigmentation. Thorax: Pronotum; central fascia lacks black margin. Mesonotum: dorsolateral and median fasciae reduced in extent, and very little black pigmentation around cruciform elevation; remaining colouration pale brown. Venation of fore wings paler than male. Legs paler, with extent of the dark pigmentation on coxae and femora reduced. Abdomen: Tergites pale reddish-brown, with only slight dorso-anterior darkening on tergites 5 to 8; posterior margins to tergites pale greenish-brown; tergite 9 pale sandy brown with dorsolateral dark fasciae extending approximately two-thirds along tergite towards posterior margin; conspicuous short silvery pubescence covers tergites. Sternites II and III pale yellow-brown; sternites IV to VII pale reddish-brown; posterior margins to sternites pale yellowish-brown; ovipositor sheath does not extend significantly beyond termination of tergite 9. General form of abdomen tapering.

MEASUREMENTS: 16♂♂ and 4♀♀. Body length: ♂ 10.7-12.4 (11.77); ♀ 11.2-12.2 (11.94). Fore wing length: ♂ 13.7-15.2 (14.73); ♀ 13.7-15.2 (14.54). Head width: ♂ 3.7-4.1 (3.91); ♀ 4.0-4.2 (4.08).

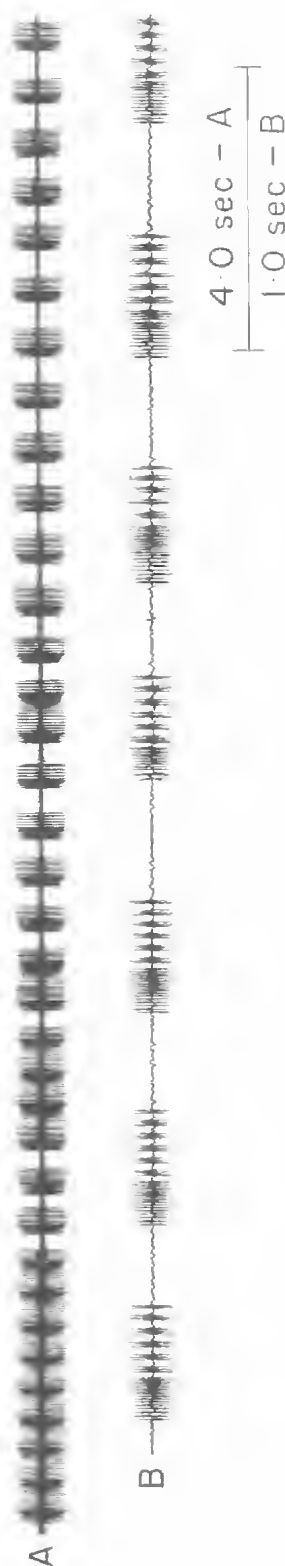


FIG. 55. Oscillograms of calling song of *P. basalis* from Ayr. Two time scales are shown.

Pronotum width: ♂ 3.2-3.6 (3.43); ♂ 3.5-3.6 (3.54). Abdomen width: ♂ 3.6-4.0 (3.76); ♀ 3.4-3.6 (3.52).

COMMENTS

P. endeavourensis Distant appears to be a junior synonym of *P. basalis*. Examination of the type of *P. endeavourensis* (Fig. 54) shows it to have more extensive brown colouration on the tergites than typical *P. basalis* specimens. In terms of morphology, the two holotypes are very similar, and are thus treated as conspecific.

This is the smallest of the *Pauropsalta* species described in this work. Its size and colouration enable it to be easily distinguished.

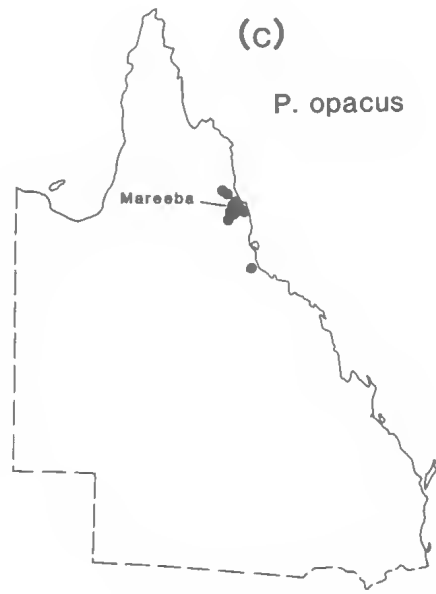
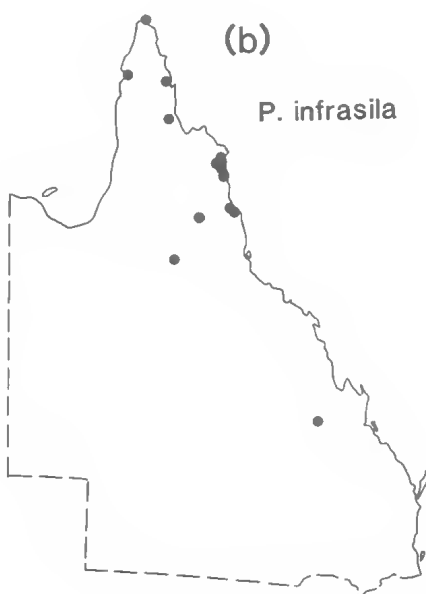
DISTRIBUTION

A northern Queensland species ranging from Mackay northwards along the coastal regions into Cape York Peninsula. Habitat preference is for dry open forest and scrubland, extending to rough grassland. Insects rest and sing on isolated tree trunks, shrubs, and grass. Specimens have been recorded from December to February.

SONG

Consists of series of repeated phrases which may be discrete, or may coalesce (Fig. 55). Each phrase is of approximately 0.30-0.45 sec (av. 0.38) duration, with a repeat interval of 0.20-0.45 sec (av. 0.31) between phrases. The phrases start and finish abruptly, with a small amplitude increase in the mid-phrase. Initially, each phrase shows an increase in pulse repetition rate, followed by a series of discrete pulse groups, usually 5 to 6 in number, each of which can be resolved into triple pulse subgroups; the final pulse group is shortened by comprising only a double pulse subgroup. Each pulse subgroup is itself composed of at least four separate pulses, which is the limit of resolution of the present data. The duration of the pulse groups range between 20-25 msec (triple) to 13-16 msec (double); intervals between pulse groups range between 10-20 msec. The initial portion of each phrase can also be resolved into the same type of pulse subgroups as described above, the increase in pulse repetition frequency occurring simply by an increase in the frequency of production of these small pulse subgroups.

FIG. 56. Distributions of (a) *P. extrema*, *P. melanopygia*; and *P. elgneri*; (b) *P. infrasila*; (c) *P. opacus*. Locality of song recording is shown in (c).



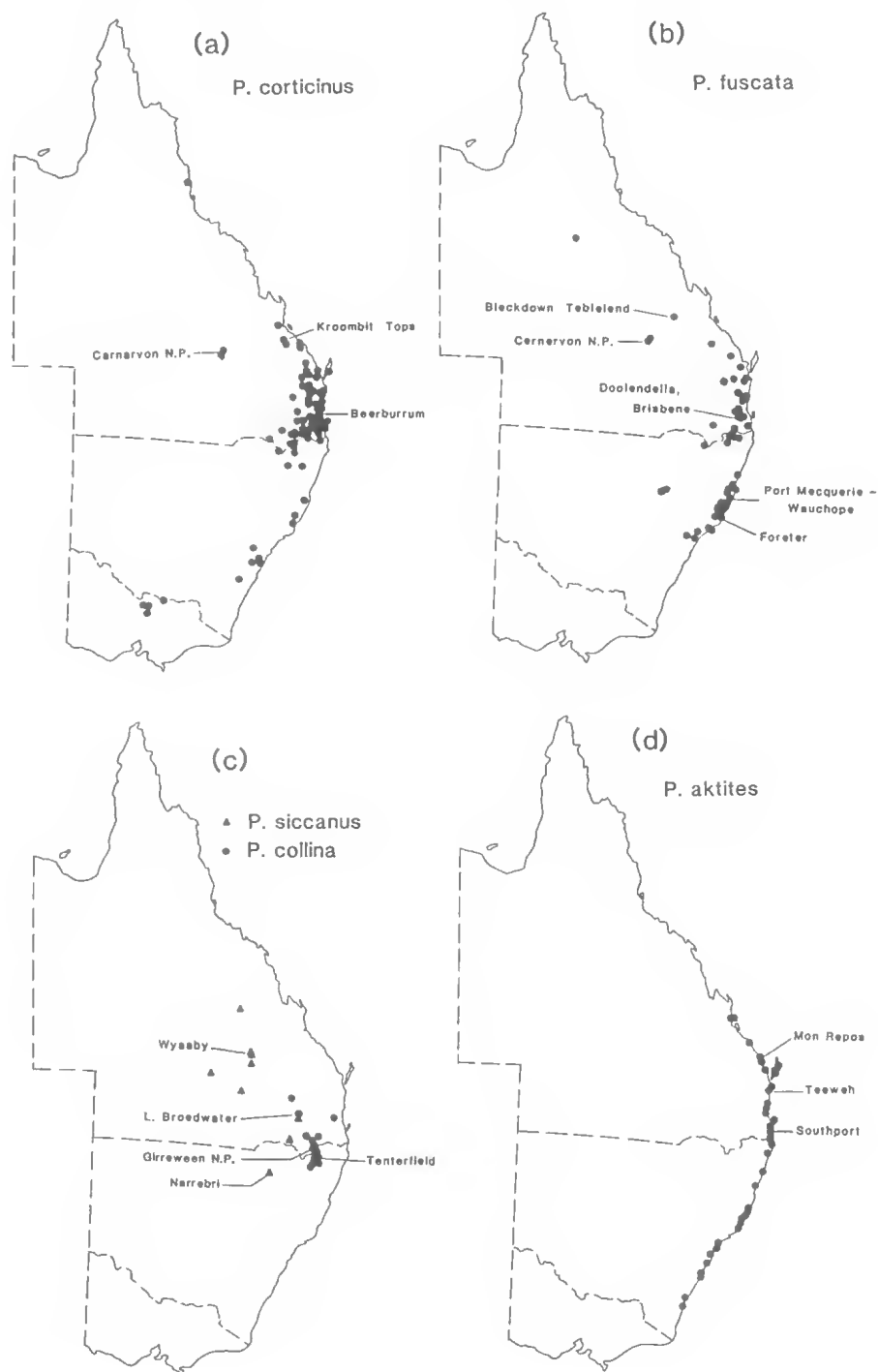


FIG. 57. Distributions of (a) *P. corticinus* (including possible records of *P. corticinus* from Victoria, and an unconfirmed record from northern Queensland); (b) *P. fuscata*; (c) *P. siccanus* and *P. collina*; (d) *P. aktites*. Localities of recordings are shown.

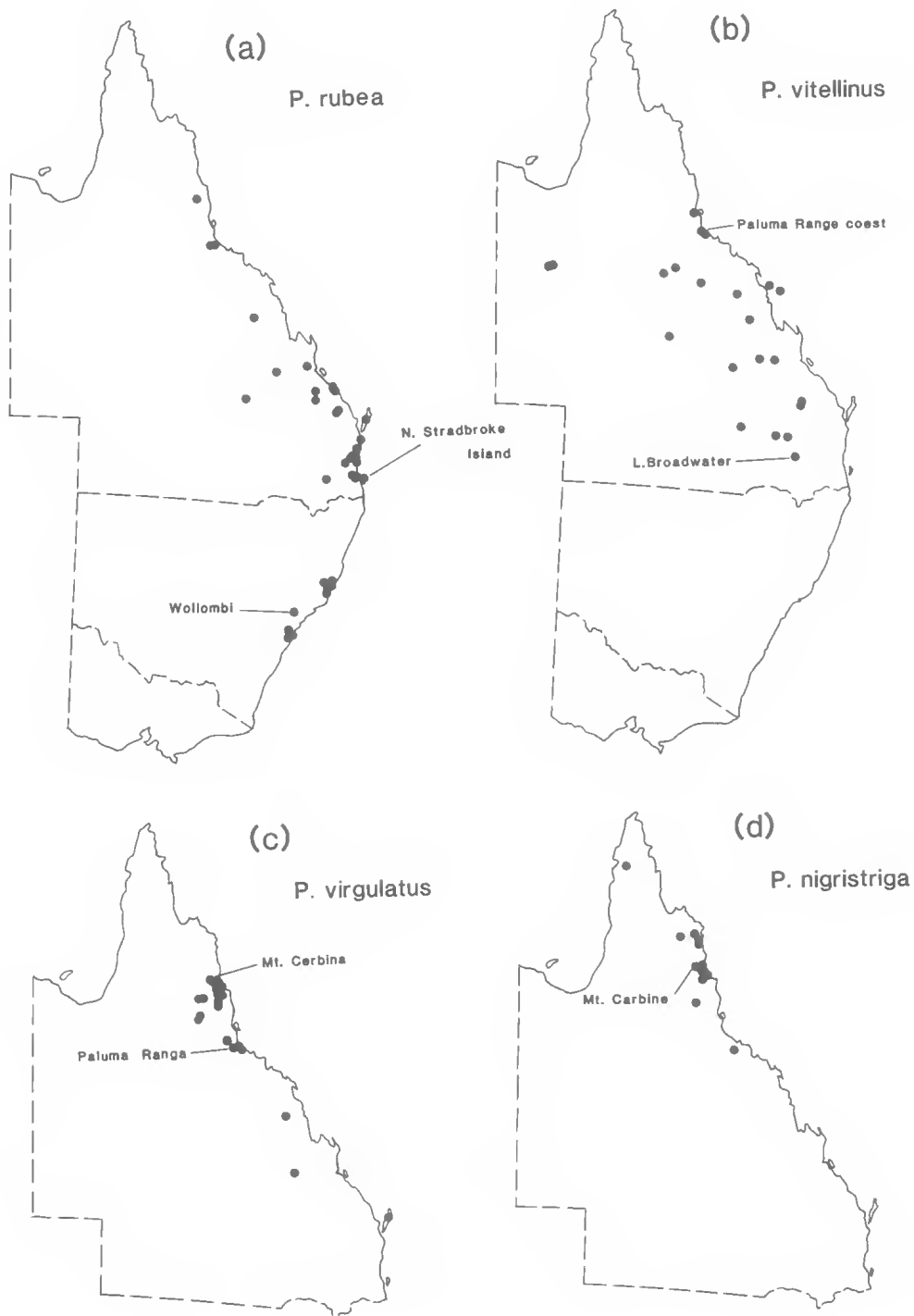


FIG. 58. Distributions of (a) *P. rubea* (including additional aural records of author); (b) *P. vitellinus*; (c) *P. virgulatus*; (d) *P. nigristriga*. Localities of song recordings are shown.

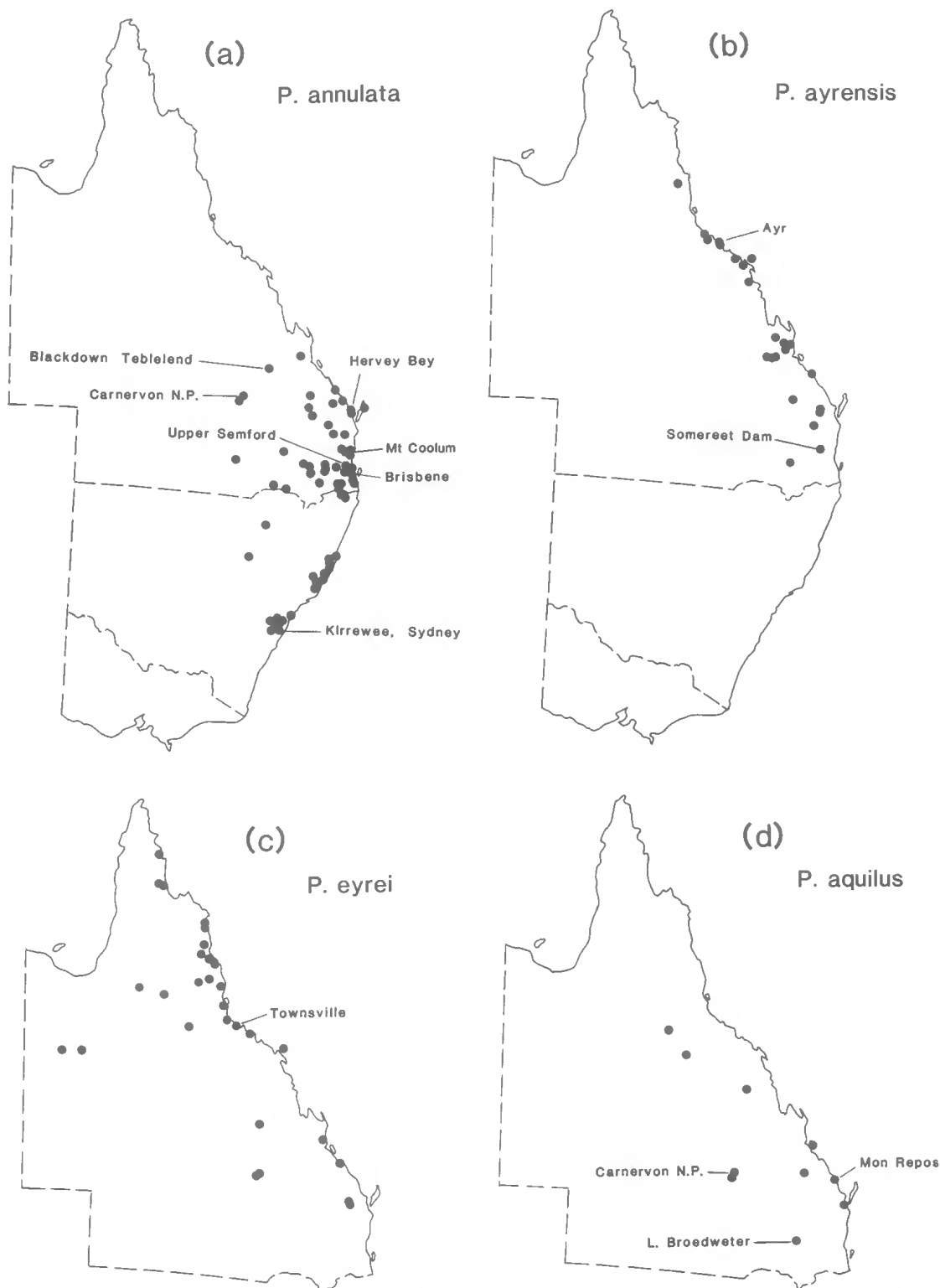


FIG. 59. Distributions of (a) *P. annulata* (including additional aural records of author); (b) *P. ayrensis*; (c) *P. eyrei*; (d) *P. aquilus* (including additional aural records of author). Localities of song recordings are shown.

ACKNOWLEDGEMENTS

The project has developed over many years and numerous people have helped, both by way of encouragement and advice, and by allowing access to collections and equipment. Special thanks are due to M.D. Webb (BMNH), M.S. Upton, T.A. Weir, and Dr M. Carver (ANIC), Dr G.B. Monteith (QM), I. Lansbury (HEC), Dr A. Neboiss (MV), Margaret Schneider (UQIC), J.S. Dugdale (New Zealand), and especially M.S. Moulds, and Dr J.T. Moss. Dr D. Young (University of Melbourne) has very generously allowed the author access to oscillograph equipment, and given much help in analyses of tapes. Dr J.T. Moss has also made a series of additional tape recordings available. In the field, many members of the Queensland Naturalist's Club have provided specimens and assistance; particular thanks must go to C. Cameron, B. Jahnke, R. Leggett, J.T. Moss, and D.M. Reeves. Dr G.B. Monteith, Mr M.S. Moulds, and M.D. Webb have spent many hours in editing the manuscript, and offering numerous suggestions for its improvement. Finally, acknowledgement is due to D.M. Reeves for the photographs of the set insects.

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